SATEL NMS PC
USER MANUAL

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1 INTRODUCTION

SATEL NMS PC is a software package designed by SATEL Oy to assist in the configuration, monitoring and diagnostics of radio modem networks consisting of equipment manufactured by SATEL Oy. The program works in Windows® XP and Windows® Vista operating systems.
SATEL NMS PC allows users to define their system as a list of networks and the constituting modems. Each network has exactly one Master modem and several substations and optional repeaters. The networks may be viewed as a list of modems or a graphical representation of linked modems. Also available are data about communication traffic, diagnostic information and alarms. Modem settings can be accessed and modified both online and locally. Automatic features are provided to assist in settings management, eg. automatic generation of routing settings.

Note: This User's Manual describes essential features and functions of the SATEL NMS PC software only. Information relating to radio network design or technical details of the different SATEL radio modem models, including the recommended settings, can be found in the manuals delivered with each product.

It is recommended that this SATEL NMS PC manual be used in conjunction with the appropriate radio modem manual for your installation.

This User Manual applies to SATEL NMS PC Version 2.0.13

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Salo, FINLAND 2010

3 NMS FUNDAMENTALS

This chapter gives basic knowledge about NMS in general and SATEL NMS in particular.

3.1 General NMS concepts

NMS stands for Network Management System. Network management is typically defined as follows:

> *Network management is the execution of the set of functions required for controlling, planning, allocating, deploying, coordinating, and monitoring the resources of a network.*

Network management can be further divided into five conceptual areas (The ISO Network Management Model):

- Performance management
- Configuration management
- Accounting management
- Fault management
- Security management

Of these areas, Security and Accounting management are used to control user accounts of the managed devices, which is irrelevant in the case of SATELLINE radio modems. The other three areas, however are relevant to radio modems, and are discussed below.

3.1.1 Performance management

The goal of performance management is to measure network performance and make available settings and controls so that performance can be maintained at an acceptable level. Performance management involves three main steps.

- Performance data is gathered.
- Data is analyzed to determine baseline (normal) operation levels.
- Appropriate performance thresholds are determined for each variable so that exceeding these thresholds indicates a problem worthy of attention.

SATEL NMS supports performance management by monitoring the operation variables of radio modems, such as signal strength (RSSI), voltage and temperature and allowing the user to define alarm thresholds for each variable.

3.1.2 Configuration management

The goal of configuration management is to monitor network and system configuration information so that the effects on network operation of various versions of hardware and software elements can be tracked and managed. Each network device has a variety of version information, such as hardware or software version numbers, associated with it. Configuration management stores this information for easy access. When a problem occurs, the stored information can be searched for clues that may help solve the problem.

The above definition of configuration management has been originally created in an internetworking environment. In a radio modem network, the version numbers of hardware and software can be tracked, and SATEL NMS makes these available. However SATEL NMS also allows changes to made to the settings of the managed devices' (ie. the radio modems') settings, which is a task usually delegated to other protocols and methods in the IP world. This feature is called Remote Configuration in SATEL NMS.

3.1.3 Fault management

The goal of fault management is to detect, log, notify users of and (to the extent possible) automatically fix network problems to keep the network running effectively. Fault management involves first determining symptoms and isolating the problem. Then the problem is fixed and the solution is tested on all-important subsystems. Finally, the detection and resolution of the problem is recorded.

SATEL NMS provides the basic tools to detect problems and make changes to the network settings from a centralized location, thus simplifying the Fault management process of your organization.

3.2 SATEL NMS

SATEL NMS is a comprehensive system for managing SATEL radio modem networks. It includes many software modules and interfaces, running on several platforms.

3.2.1 Features

The main features of SATEL NMS are summarized below.

- Non-intrusive operation
- Remote configuration
- Monitoring of network operating parameters
- Network design tool

3.2.2 Components

SATEL NMS consists of a set of interfaces and features offered by certain SATEL radio modem models, including SATELLINE-3AS(d) NMS, SATELLINE-3AS(d) Epic NMS and SATELLINE-3AS(d) VHF. Using SATEL NMS it is possible to monitor the deployed radio modem network for certain diagnostic parameters and, if necessary, make changes to the modems' settings online.

The NMS Solution provided by SATEL consists of the radio modems, which support the NMS Protocol, and the SATEL NMS PC software package, which provides setup and monitoring functions.

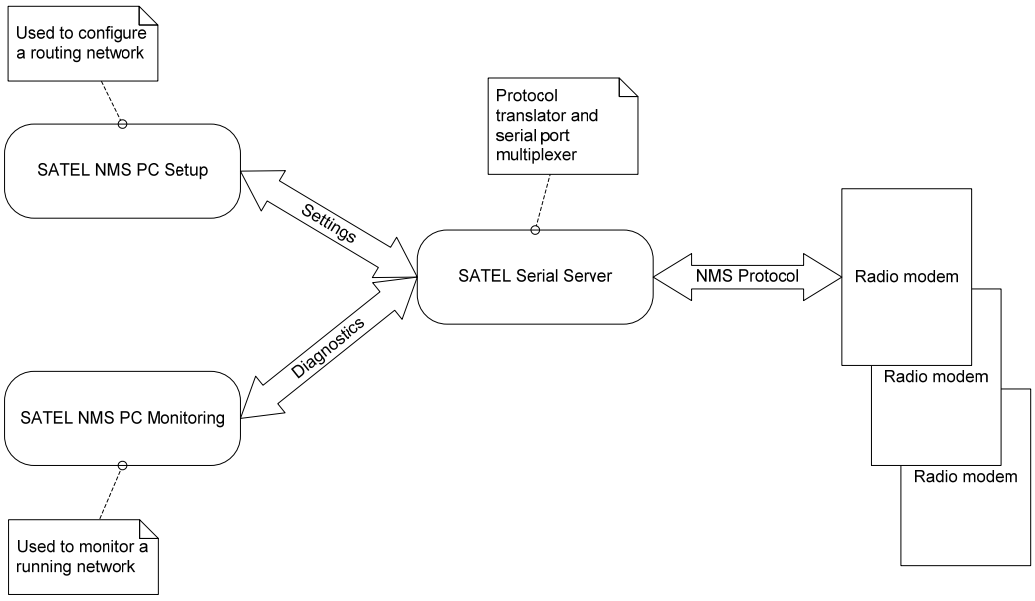


Figure 1: SATEL NMS Components

3.2.3 Software

The SATEL NMS PC software package contains SATEL NMS PC Setup, SATEL NMS PC Monitoring, SATEL Serial Server and Packet Filter Editor.

SATEL NMS PC Setup is used to design the modem network and upload the initial settings to the modems. After deployment, the software can be used to make changes to the settings remotely by radio connection. Also routine maintenance tasks such as replacing or adding a modem to the network, running communication tests etc. are possible using the software.

SATEL NMS PC Monitoring is used to monitor a deployed radio modem network while it is in operation. It provides logging of network parameters and events displays trend graphs and can react to events by sending alarms and running external commands.

SATEL Serial Server provides the other applications multiplexed access to the serial ports of the computer.
Packet Filter Editor is used to define packet filters needed for custom data protocol support.

3.2.4 NMS Protocol

The most basic method of controlling the SATEL NMS features is through a modem's diagnostics port, which is one of its serial ports set to operate in the diagnostic (NMS) mode. The NMS port accepts binary NMS commands. This is called the *NMS Protocol*.

Since the NMS Protocol is a binary protocol, it is not designed for human eyes. Another protocol, called the *SATEL Serial Server Command Protocol* (S3CP) is an ASCII protocol, and is suited for interactive command line operation as well as software controlled operations. However, the modems currently in production do not directly support S3CP. Instead there is a MS Windows program called SATEL Serial Server (part of the SATEL NMS PC installation), which among other things translates S3CP to the NMS Protocol and back.

The above protocols allow access to all the diagnostic parameters of the modems in the radio network. The RAM memory of the modems being scarce, the modems do not generally store large log files themselves. Instead, diagnostics are polled from the radio modems at regular intervals and stored in a central location, usually a Windows PC running SATEL NMS PC Monitoring.

3.2.4.1 Message sending modes (ONLINE and OFFLINE)

SATEL NMS can send messages in one of two modes.
If the mode is OFFLINE the packet will be sent immediately to the radio network. If there is already a packet, such as a user data packet in the modem network, and the modem network contains long repeater chains, the new packet may collide with the data packet. This is referred to as the Offline operation mode, because it is best used when the user system is offline and no user data is being transmitted, but NMS messages are.

If the mode is ONLINE the packet will be placed in the modem's buffer and wait for a user data packet to be sent to the network *to the same address as the new NMS packet*. When such a user packet is sent, the NMS frame is attached and sent inside the same transmission, thus avoiding collisions. This is known as the Online mode, as it must be used when the user system is Online. *If there is no user data traffic, NMS frames will not be sent at all in this mode!* This mode depends on the user system to poll each modem in turn. If a modem is not contacted by the user protocol, NMS packets are not able to reach the modem either. This mode should be used when there is much data traffic to all modems and data packet loss due to NMS vs DATA packet collisions is not acceptable.

4 USING THE SOFTWARE

SATEL NMS PC can be used to

- Design a network of SATEL NMS modems
- Apply settings to SATEL modems
- Remotely change settings of SATEL modems
- Monitor a network of SATEL modems

4.1 Overview

To get started quickly with your NMS modems:

1. Install SATEL NMS PC to your Windows XP or Vista computer.
2. Connect one of your modems to the PC. (See 4.2 for details)
3. Start the program.
4. Click the *New network button*.
5. Follow the To-do list, clicking each item in turn, to create your network.
6. Once you have completed the To-do list, test your network by running the *NMS Radio Connections* test.
7. Once all modems respond you can start monitoring the network by clicking *Monitoring…* and *Start SATEL NMS PC Monitoring* button.

See Chapter 5.9 for more detailed instructions

4.1.1 Next steps

Once you have successfully tested the modems and monitored the network in OFFLINE mode, you can proceed to connect your own equipment to the modems. The Master modem needs to be connected both to your master device and to SATEL NMS PC, using a two-port serial cable. If you need to change the serial port settings of the modems or the Protocol settings of the network, you can do so using SATEL NMS PC through radio (Remote Configuration), if you can keep all the modems powered up while doing so.

Adjust the Network protocol setting and make sure the terminal addresses are configured correctly this time. Click *Check Routing* to create routing tables and finally Apply changes to all modems that require it (this can be done through the radio too, no need to change the modem connected to the serial port). Then start your own system, and switch SATEL NMS into ONLINE mode. Now you can ping, change and read settings and monitor all modems while your own system is working simultaneously.

Please read the rest of this user manual to gain comprehensive insight into the operation of SATEL NMS. You can also contact SATEL technical support, who will be happy to help you in case of problems.

4.2 Installation

SATEL NMS PC is installed by running the installer program. This installer copies all files into the Program folder, defaulting to {the Windows 'Program Files' folder}\SATEL NMS PC.
For example: *C:\Program files\SATEL NMS PC*

You have the option of installing the full product or just the Monitoring features. Use the Monitoring installation option when installing to a workstation or user account which must not be allowed to make modifications to the settings of your radio modem network.

Installation option	*Features*	*Software installed*
Full installation	Setup and Monitoring	SATEL NMS PC Setup SATEL NMS PC Monitoring SATEL Serial Server Packet Filter Editor
Monitoring	Monitoring only, no possibility to change settings	SATEL NMS PC Monitoring SATEL Serial Server

4.2.1 File types of SATEL NMS PC

Extension	*Location*	*File type*	*Programs*	*Explanation*
.sax	Install directory	SATEL System File	*Setup* and *Monitoring*	This file contains a saved system, including all networks and modems.
.log	Install directory or user defined Log Directory	Log file	*Monitoring*	Contains network events. TAB-separated values. See chapter 6 for more information.
.xml	Install directory	Packet Filter definitions	*Setup* and *Packet Filter Editor*	Allows SATELLINE NMS radio modems to support various data protocols.
.ID	Install directory	NMSID definitions	*All*	SATELNMS.ID contains NMSID definitions. In some cases this file might need to be updated when modem SW version is updated

Note: Do NOT alter any files manually, instead use *SATEL NMS PC* to load, modify and save the files.

4.3 Connecting the modems

This user guide only addresses connections needed for the NMS system. Mounting the modems physically, connecting antennas and power supplies are addressed in the modem manual.

4.3.1 Serial ports and functions

There are two serial ports on each SATELLINE-3AS(d) NMS or VHF modem, Serial Port 1 and Serial Port 2. Each of these ports has three possible functions, one of which can be active at a time.

- DATA, used for user data transfer
- NMS, used for NMS protocol
- OFF

Note that only one of the ports can be a DATA port and one can be an NMS port at the same time, so for example having both ports in NMS mode at the same time is not possible.
The usual NARS-1F cable allows access to serial port 1. However, to access both port 1 and 2 at the same time, a two-port serial cable (for example CRS-NMS) is needed. This cable has one 15-pin connector (connected to the modem) and two 9-pin connectors, which are labelled '1' and '2', corresponding to port 1 and port 2 of the modem. *By default the connector labelled '2' is used for NMS.*

See modem manual for information on how to change the function of the ports.

4.3.2 Connections during network setup

During initial network setup, SATEL NMS PC needs a NMS PROTOCOL connection to all modems to synchronize their settings.
There are two useful ways to connect the modems during setup:

1. Full operation connection
2. Programming mode setup connection

See *Table 1: NMS Port Connection* methods for details.

Connection methods	*Full operation connection*	*Substation data connection*	*Programming mode setup connection*	*NMS demo master connection*	*NMS demo substation connection*
Purpose	SETUP and/or DEPLOYED. Required for a deployed master modem.	DEPLOYED substations	SETUP	DEMO	DEMO
Description	Serial and radio DATA and NMS connections available	Serial port DATA, NMS radio connection	Setup only, no radio connection possible	NMS serial and radio connection only	NMS radio connection only
Picture	Figure 2:Full operation connection		Figure 3: Programming mode setup connection		
PROG mode enabled?	NO	NO	YES *)	NO	NO
Cable needed	CRS-NMS-01	NARS-1F	NARS-1F	NARS-1F	NARS-1F (power only)
PORT 1 function	DATA or NMS	DATA	Terminal setup & NMS	NMS	*any, not used*
PORT 2 function	NMS or DATA	*any, not used*	*any, not used*	*any, not used*	*any, not used*

Table 1: NMS Port Connection methods

*) Programming mode is usually used with terminal emulation software (such as SaTerm) to access the Terminal Setup menu of the modem. Instead of terminal emulator software, SATEL NMS PC may be connected to the modem, as the modem will respond to NMS protocol messages while in programming mode. In this case the modem can only be configured, radio messages *cannot* be sent while the modem is in programming mode.

4.3.2.1 Connection procedure

This procedure must be followed when swapping modems connected to the PC.

1. Power modem off
2. Disconnect previous modem
3. Connect new modem
4. Power modem on

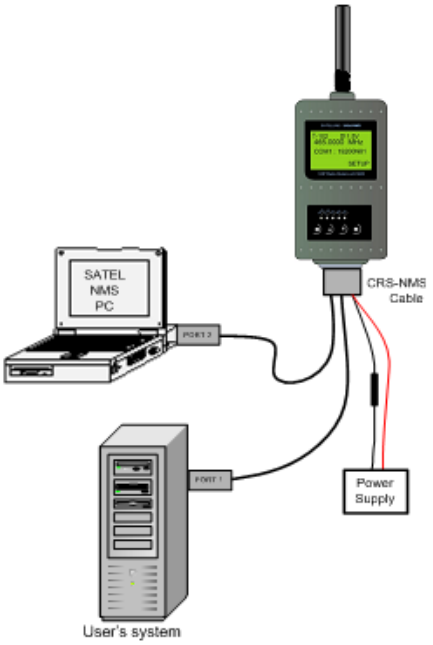


Figure 2:Full operation connection

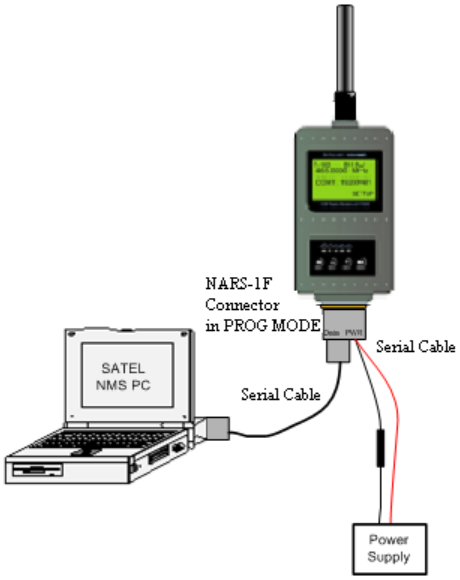


Figure 3: Programming mode setup connection

4.3.3 Connections in a deployed system

One of the modems in a deployed system is the *Master Modem* of the system. The other modems are *substations* (including *repeaters*).

The *Master Modem* is special since the SATEL NMS PC software connects to the rest of the modems through the master modem. One serial port (typically port 1) is configured as the DATA port and the other as the NMS port. The NMS port should be connected to the PC. SATEL NMS PC will connect to this serial port to send and receive NMS PROTOCOL messages from the master modem and all the substations.

A *substation* modem in a deployed network only needs a serial connection to the data terminal equipment, since all NMS commands are sent and received through the radio. (See Figure 4). The NMS port is not used in these modems, only the DATA port needs to be connected to the user equipment.

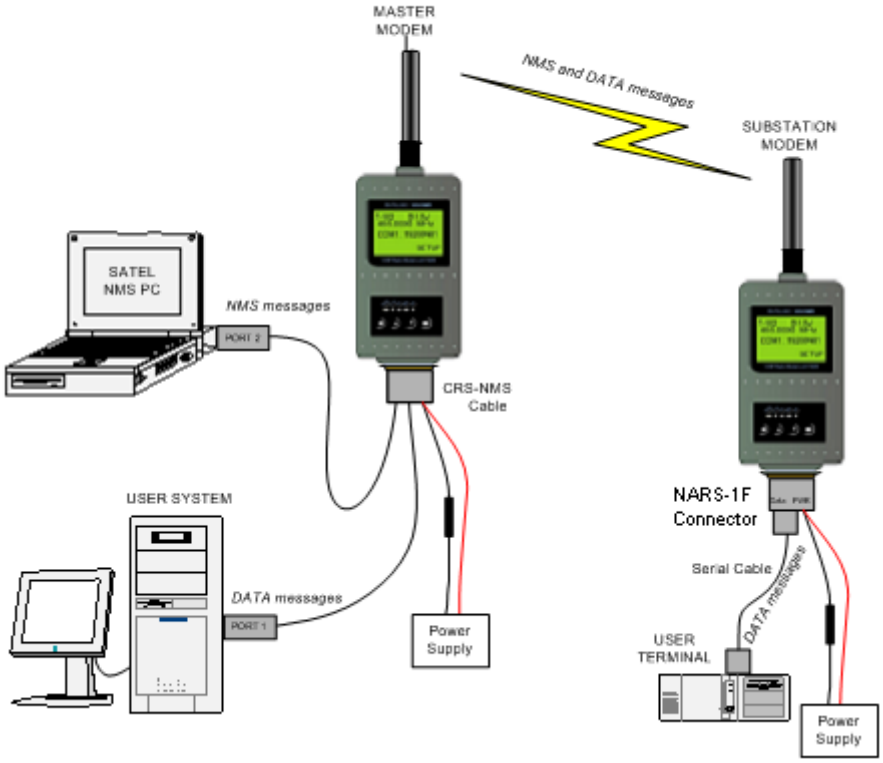


Figure 4: Serial connections in a deployed NMS network

4.3.4 Special connections

Note that in some cases the port configuration may need to be changed so that port 1 is used for NMS and port 2 for DATA. One such case is if RS-485 is needed for data at the Master modem. RS-485 is only supported on port 2 of SATELLINE-3AS(d) NMS, therefore data must go on port 2 and NMS on port 1, which is opposite to the normal case.

Another case is when no two-port cable is available, a regular interface connector (e.g. NARS-1F) may be used to *demonstrate* NMS features by setting port 1 as the NMS port on the *Master Modem*. This configuration is only usable for NMS PC demonstration purposes, as user data cannot be transferred in this configuration. *Substation* modems do not need any serial ports to be connected at all for the *demonstration*.

4.3.5 Connection checklist

To establish a connection between SATEL NMS PC and a modem, please follow the checklist below. Also see Table 1.

1) Make sure the modem has power
2) Make sure that the modem is in the appropriate operating mode.
    a. Programming mode if you wish to change the settings of the local modem only.
    b. Normal mode if you wish to also use the remote control features
    c. If using the CRS-NMS-01 cable, there is no programming mode switch and this step may be ignored.
3) Identify the port which has been configured as the NMS port of the modem. If the modem is in programming mode, port 1 is used. In Normal mode, either port 1 or port 2 may be configured as the NMS port. If you are unsure, see the modem's setup screen or you can first connect the modem in programming mode and change the port setting before going back to normal mode.
4) Connect the modem's NMS port to any free serial COM port of the computer using serial cable.
5) Start SATEL NMS PC
    a. Click New Network
6) The PC's serial port needs to be opened. Click the **Connect** button in SATEL NMS PC Setup. The connect window (Figure 21: The Connection settings window) appears.
    a. Click **Detect available COM ports**. SATEL Serial Server is started automatically in the background. A list of serial ports in the machine then appears.
        - If you have firewall software installed you might be asked to allow outgoing connections from SATEL NMS PC, or to allow SATEL Serial Server work as a server. SATEL NMS PC does not usually connect to the Internet, but this needs to be allowed because Serial server and the other programs communicate with each other using the IP protocol in the local machine.
    b. Select the correct port from the list and click **Test connection**. A NMS message is sent to the port to see if a modem answers. If "No response" is received, try another port or check your cables and port settings.
    c. Once the modem responds, click OK to proceed.
7) SATEL NMS PC Setup will ask what to do with the found modem. If you wish to create a new network using the modem, click Add and start following the TODO List. See 5.4 for

more information. Otherwise you may just click Add and go the *Modem View* if you wish to examine and/or change the individual modem's settings.

4.3.6 IP Connections

Instead of a serial port connection, SATEL NMS PC Monitoring and Setup are able to use an IP (Internet Protocol) connection to the master radio modem. This is useful in case a serial cable cannot be used for some reason, such as the distance between the PC and the master modem. In this case additional hardware is usually needed to act as a bridge between the internet and the master modem. Usually a serial port server is used.

Note that most port server hardware available come with *virtual serial port* drivers which can be installed on the PC. You may wish to use a virtual COM port instead of an IP port connection in this case. If you decide to use virtual COM ports, the connections from SATEL NMS PC programs are defined as usual with normal COM port, see above in this chapter.

4.4 Designing Systems and Networks

4.4.1 General notes about networks

In SATEL NMS PC a *system* may contain one or more *networks*. The distinction between systems and networks has been adopted to allow monitoring of multiple networks at the same time. Each network has its own master modem, repeaters and substations, which do not communicate with the modems of other networks.

A separate connection (Serial port or IP address) from SATEL NMS PC is needed to communicate with each master modem, and thus, each network.

4.4.1.1 Protocols, Packet filters and Terminal addresses

Setting the protocol affects the Packet Filters of the master modem. Packet filtering is a feature that allows the modem to detect addresses from the user's data packets, and use routing tables to route the packets to the correct substation modems. This feature also requires that substation modems have at least one terminal address defined. Repeater modems do not need terminal addresses, but may have them.

4.4.2 Essential network information checklist

Following table lists information you need to determine and have at hand while you are designing your network. You can print or copy it and use it for reference while designing the system.

Item	*Explanation*	*Your notes*
General system topology	How many networks will your system consists of? Each Master or Base station you have will become the Master Station of one Network. Each network has exactly one Master Modem.	
Network ID	A string of 8 characters. Select a unique ID for each network in the system. The modems only accept radio messages sent by modems that have a matching Network ID. This prevents data from neighbouring networks operating on the same frequency from getting mixed up with the other networks' traffic. Note that usually neighbouring networks should have different frequencies. Network ID is an additional safety precaution.	
Frequency	You will usually need to apply for a private frequency from the local authorities. Make a note of this frequency and input it into the program when asked. Your modems will usually come from SATEL with the frequency already programmed, but this depends on the situation.	
Network data protocol	Which data protocol is your network using? MODBUS, IEC 60870, ANSI or even SATEL I-Link? SATEL NMS PC Setup needs to know the protocol, so that correct Packet Filters can be loaded into the master modem. For NMS demonstration networks without any data traffic, any protocol is fine.	
Terminal addresses	You'll need the protocol addresses of all the terminals you plan to connect using the radio modem network and information about which radio modem substation each terminal will connect to. If you are only using the modems to demonstrate NMS without actual user protocol traffic, terminal addresses still need to be	

	defined so that routing tables are generated. SATEL NMS PC and the Master Station modem depend on the routing tables to send NMS messages to the substation modems.	
Substation names	Each radio modem should be named using a descriptive name; the location where the substation is to be deployed is normally used.	
Link budget	You'll need a link budget so you can select the correct TX Power settings for the modems. For desktop testing use the lowest TX Power setting possible, and switch to the proper TX Power calculated in the link budget before deploying.	
FEC on or off?	FEC stands for Forward Error Correction. Enabling FEC improves data transmission reliability, at the cost of some of the data transmission capability. Please consult the modem manual for details.	

4.4.3 Creating a simple Network

Here are step-by-step instructions for designing a network.

1) Connect a modem using a serial cable as explained in 4.3
2) Start the SATEL NMS PC Setup program
3) Click New Network
4) The TODO List appears. Click all the TODO List items in order. (You can also skip some steps if you want to do them in a different order). The program will ask you to input some values and select some settings. The list below will offer some help. You will also need to refer to the essential network information checklist you filled above.
    a. Click Name the network and input a name for your network.
    b. Click Add the first modem. The program will ask you to configure communication settings. Click OK. The Communication settings window appears.
        i. Click Detect available COM ports
        ii. Select your COM port by clicking on it on the Available COM ports list.
        iii. Click Test Connection. If your modem is detected, its serial number will appear beside the Test Connection button. Otherwise a Timeout or error is reported. Check your cable and port settings on both the modem and PC. If the modem is in Prog mode, it's port settings are always 9600,8,N,1.
        iv. Once your modem responds when you click test connection, close the window by clicking OK
        v. Wait while settings are loaded.

c. Click **Choose network settings**
    i. If the Frequency is incorrect, input the correct frequency by clicking **Chance…**
    ii. Input your Network ID by clicking **Change ID**
    iii. Set FEC on or off
    iv. Select the Protocol by clicking **Select Protocol**
    v. Ensure the NMS Message transfer mode in **OFFLINE** at first. Change it to ONLINE once your data traffic is running.
d. Click **Choose settings for Master Station**
    i. Change name if you wish
    ii. Select TX Power
    iii. NO Terminal addresses are needed for the Master station
    iv. Choose serial port settings
e. Click **Add a new modem**
f. Click **Choose settings for Modem 2**
    i. Change name if you wish
    ii. Select TX Power
    iii. Define one or more terminal addresses, unless this is a Repeater with no connected terminals. There must be at least one terminal at the end of each repeater chain. Use "dummy" terminal addresses if you don't have any real ones (if this is demo network, for example).
    iv. Choose serial port settings
g. Click **Add link to Master Station**
    i. Draw a link to the other modem
h. Click **Calculate Routes**
    i. Do not Synchronize yet
i. Click **Name the System**
j. Click **Save the system**
k. Click **Synchronize Master Station**
    i. Wait while master station modem is synchronized
l. Click **Synchronize Modem 2**
    i. Since the modem connected is the master station, the program will display the *Unknown modem address* dialog.
    ii. Connect your second modem to the serial port (observing the proper connection procedure in 4.3.2.1) and click OK.

iii. The program will display the Serial number of the modem and asks if you wish to associate the modem. Click Yes

iv. Wait while the modem is synchronized.

m. Click **Save the system**

5) Now you have a two modem network properly configured.

6) Re-connect your master modem and click the **Detect** button in the toolbar to ensure it is connected.

7) Go to the *Network info view* by clicking the network's name in the *System tree view*

8) Using another cable, ensure your other modem has power. Attach antennas to both modems.

9) Test the network by clicking **NMS Radio connections** under the *Tests* groupbox.

   a. Both modems should respond.

10) Now your two modem system is configured and tested! Next steps are

   a. Add more modems

   b. Configure Monitoring settings

   c. Run extensive desktop tests

   d. Deploy the network

4.4.4 Adding modems to an existing network

Modems may be added by clicking **"Add Modem using defaults"** in *Network design view (5.7.4)*. The settings of the new modem are copied from the Default Modem settings (see below).

In addition, SATEL NMS PC Setup will manage the settings so that network-wide settings such as Frequencies and FEC are the same in all modems.

> **Using the Default Modem settings**
> Use the Defaults Modem settings view to ensure that all modems will have the same general settings. Go to the *Default Modem view*, by clicking on **Default modem** under **Settings** in the *system tree view.*
>
> Now change the default modem settings to the values which will be common to all modems in the network. For example, if all terminal equipment have 19200 bps as data rate, change the setting in the *Default Modem view*.
> Now whenever you create a modem using the **Add Modem using defaults** command, it will have this data rate already selected.

After adding the modem, add a logical radio link to the Master Station, or if a direct link to the master is not possible, nearest repeater.

- Select the modem icon
- Right click
- Select **add link**
- Click the target modem

4.4.5 Defining Terminal Addresses

For routing to work, each modem must have a terminal address, or several addresses in case there are several user terminals connected to the data port using for example an RS-485 adapter. These correspond to the actual addresses of the user's protocol. SATEL NMS PC will use the defined terminal addresses to generate the routing tables of the master modem.

Note that although the terminal addresses are defined in the Modem View, the terminal addresses are only saved to the master modem in the form of the routing tables. Therefore changing a terminal address does not necessitate updating of the substation modem settings, only the master modems' settings.

The Terminal addresses are defined in the *Basic Settings tab* of **Modem View.** Select each modem in turn on the tree view under the Modem List item and define their terminal address(es) by clicking on the "**Add...**" button under the Terminal Addresses heading.

The terminal addresses are defined using the Input Terminal Address window (Figure 5), which appears when the "Add..." button is clicked.

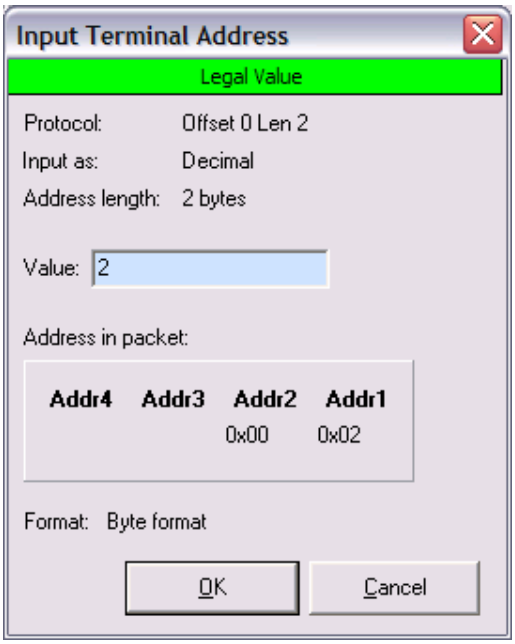


Figure 5: Input Terminal Address window

The green/yellow/red bar on top shows if the address you are typing is legal or the selected protocol filter.

The format of the number you are inputting; Decimal, Hexadecimal or ASCII, depends on the selected protocol. The length of the address depends on the protocol that is in use. The maximum length is four bytes.

- In decimal mode, values from 0 to 4294967295 are accepted.
- In hexadecimal mode, values range from 0 to FFFFFFFF.
- In ASCII mode from one to four characters are accepted.

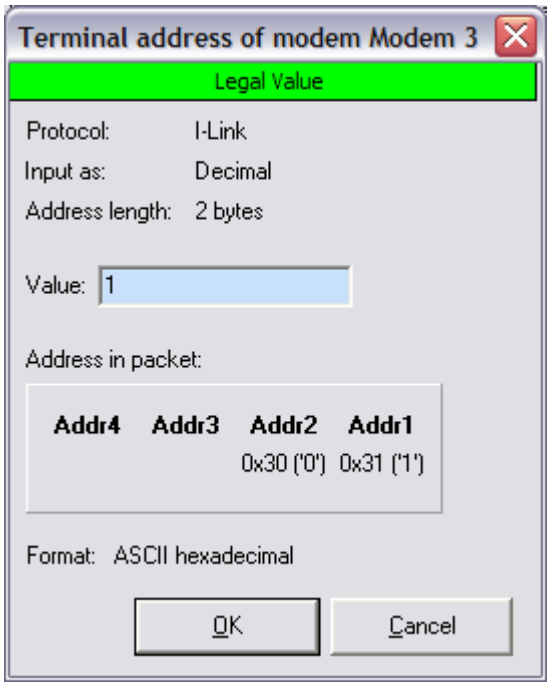
In all cases the value is displayed in Hexadecimal format in the Address in packet box. AddrN (Addr1 etc.) refer to the packet filter address bytes. This information can be useful when defining custom protocol filters using Filter Editor.

You must take care to input the address of the equipment that will be actually connected to the modem in question once the network is deployed.
A terminal address may be changed by double-clicking on it in the list in Modem View.

4.4.6 I-LINK Protocol

The SATEL I-LINK PC protocol is an ASCII protocol, i.e. it uses human-readable characters in the protocol packets. To use SATEL NMS with I-LINK as the DATA protocol, remember to select the I-LINK protocol in the Main Network View.
The slave address is input in decimal format.

The address set using the dipswitches of the I-LINK 100 I/O Converter must be converted to a decimal number. For example if dipswitches "64", "16" and "1" are selected, the address is 64+16+1 = 81 in decimal format. See the I-LINK manual for details about the address format.



For example Address 1 will appear as Addr2=0x30('0) and Addr1=0x31('1'), because character '0' equals 30H and character '1' equals 31H in the ASCII character coding system.

4.4.7 Generating Routing Tables

Click the Check Routing button in the toolbar. A message box will appear to inform you what settings were automatically changed. The Routing tables of the Master modem are generated based on the links drawn between modems and on the terminal addresses defined in the Modem View. If you change either of these, click Check Routing again.
Routing tables are saved to the master modem when it is synchronized.

4.4.8 Transmitting Settings to the Modems

All changes to the network so far have only affected the settings within SATEL NMS PC. Now the settings are to be transmitted to the modems. To accomplish this, each modem in turn is connected to the PC and their settings are then uploaded from the PC into the modem.

1) Go to the modem's Modem settings view
2) Click Synchronize
3) If SATEL NMS PC has not connected to that modem before, it shows the Unknown modem address dialog (See 5.8.2). In this case, connect your modem and click OK.
4) Wait while the modem is synchronized.

Repeat the above sequence for each modem.

If at any time you are not sure of which modem is connected to SATEL NMS, click the Detect button.

4.4.9 Testing the network

First connect the Master modem to the PC and click Detect.

A Ping test is provided for easy testing. Right click on any modem in the routing view and select ping. SATEL NMS PC will send a RSSI request to that modem and measure the time it takes the modem to answer.

Naturally, the Monitoring window may also be used to test the network.

5 SATEL NMS PC SETUP

This chapter explains how to use SATEL NMS PC Setup. At the beginning of the chapter you will find an overview of the program features and a list of common tasks. Towards the end of the chapter all the commands, views and windows of the program are explained.

5.1 Overview

SATEL NMS PC Setup is a network administrator's tool, and it allows the user to:

- Set up a radio modem network initially
  - Draw the network using modem icons and link arrows
  - Automatically determine radio modem settings for each modem of the network
  - Upload settings to each radio modem individually
- Run a series of tests on a radio modem network
- Change radio modem settings remotely using the radio connection
- Add radio modems into the network
- Replace radio modem hardware
- Configure monitoring settings for SATEL NMS PC Monitoring
- Save and load radio modem network files

5.2 Common tasks

This subchapter lists some common tasks and how to perform them. Refer to later sub-chapters for explanation of the different windows, views, commands etc. of the program.

5.2.1 Creating a new network

Software required: SATEL NMS PC Setup

Setting up a network of SATEL NMS-capable modems using SATEL NMS PC Setup is relatively easy. Broadly speaking, the process consists of the following steps.

1. Acquire at least two radio modems and necessary cabling
2. Install and start SATEL NMS PC Setup
3. Create a new network in SATEL NMS PC Setup
4. Follow the TODO List in the lower left-hand-corner of the program window
   a. The TODO List consists of task buttons which you click in order, and the program then asks you to input certain data and settings related to each task to create your network.

b. Finally the system file is saved to disk and the modem settings are synchronized one modem at a time

5. Test your network's radio connections in your lab
6. Deploy your network

Please see chapter 5.9 for more detailed instructions.

5.2.2 Adding a radio modem substation or repeater to an existing network

Software required: SATEL NMS PC Setup

Go to *Design View* and click New Modem. Then follow the *TODO-List* to finalize settings. (Add necessary links to/from the new modem. Add a terminal address. Select serial port settings. Click Calculate Routes. Synchronize the Master and the new modem)

Finally test the new modem before deploying.

5.2.3 Replacing a deployed broken radio modem with a spare

Software required: SATEL NMS PC Setup
You need to have access to the .sax file for the system which the broken modem is part of.
Load the .sax file. Then connect the spare modem to your PC and go to the *Modem View* of the broken radio modem. Click Replace Modem and follow the instructions. Once the spare modem has been synchronized, test it. Finally go to your site to remove the broken modem and install the spare modem.

5.2.4 Setting up a redundant master modem

Software required: SATEL NMS PC Setup

Purpose: Configure settings so that NMS Monitoring is able to cope with a radio modem network where the master station is redundant, i.e. there are two master radio modems, one of which is the primary device, while the other is a backup. Your own system (e.g. SCADA) is responsible for powering up the secondary modem in case the primary modem stops responding for some reason. SATEL NMS PC Monitoring has a connection to both modems and will use whichever is currently powered up to monitoring the radio modem network.

What to do: First set up a network with one of the master modems. Then, when everything works, duplicate your network and use Replace Modem on the master modem in this new duplicate network, replacing it with the backup hardware. Also go to *Network settings view* and in the Primary Network selection box, select the original network. Also use different COM port for each. Now Monitoring can use the backup master if the primary master stops responding, and vice versa. Note that all the substation radio modems appear in both networks. If there are changes to the substation modems, these changes need to be duplicated in both networks.

Strictly speaking this is not a problem, unless modems are added, removed or replaced. Best course of action is to make all changes in the primary network and then remove the secondary network and duplicate it again as explained above.

5.3 Main window

When SATEL NMS PC Setup is started, the main window appears. The main window is divided into areas which have different purposes.

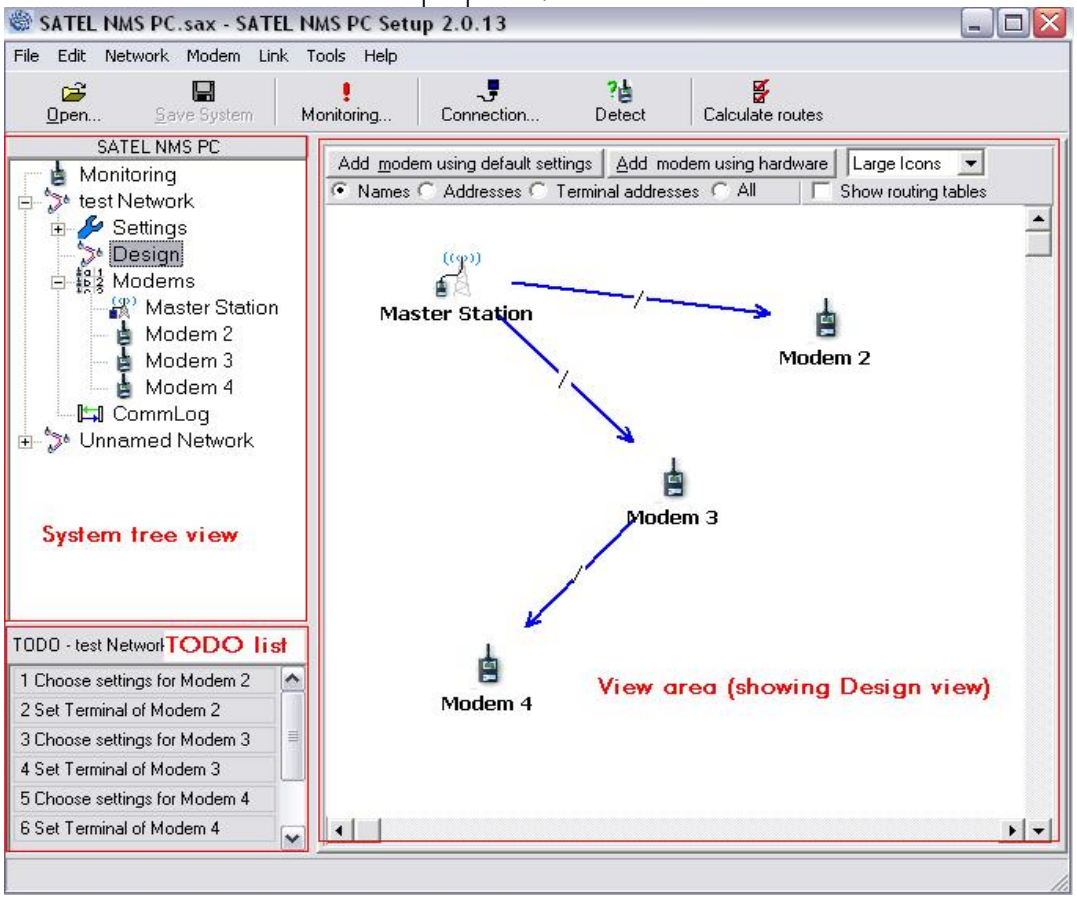


Figure 6: SATEL NMS PC Setup Main Window

Main window area	*Purpose*	*More information*
Menu bar	Most commands appear in the menu. Some of the commands are also usable from the various views	See chapter 5.5
Toolbar	Most common commands can be run from the toolbar	See chapter 5.6
System tree view	Shows the structure of your System (networks, modems etc.). *Click on items in this tree to access the different views.*	For information about the views, see chapter 5.7
View area	This area shows the currently selected view.	For information about the views, see chapter 5.7

TODO List	This area always shows remaining tasks you need to accomplish to get your system working properly. *Click on each task* in order to complete them!	See chapter 5.4

5.4 TODO List

Following the *TODO List* is the easiest way to set up a system. The *TODO list* also works constantly after initial setup, by reminding you which settings operations (such as synchronizing modems) need to be performed to apply your changes or getting your new modem to work as part of the network, for example.

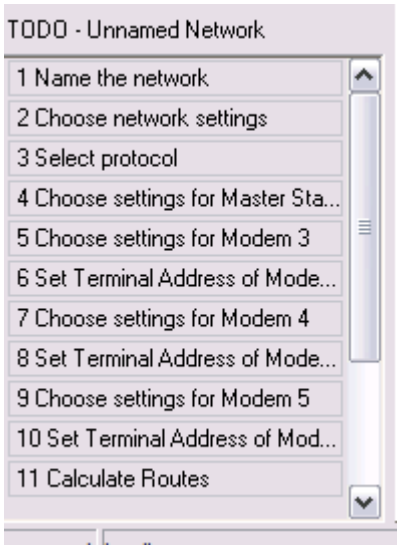

TODO - Unnamed Network
1 Name the network
2 Choose network settings
3 Select protocol
4 Choose settings for Master Sta...
5 Choose settings for Modem 3
6 Set Terminal Address of Mode...
7 Choose settings for Modem 4
8 Set Terminal Address of Mode...
9 Choose settings for Modem 5
10 Set Terminal Address of Mod...
11 Calculate Routes

Figure 7: TODO List

Click on the *TODO List* items in order. The *TODO List* will constantly update itself to show remaining tasks.

When clicked, items in the list execute an action, such as showing a dialog window to ask you for the system name.

TODO List item	*Explanation*
Name the system/network	Opens a dialog to ask the name
Choose network settings/settings for modem	Shows the relevant view and a short message explaining the view
Select protocol	Opens a dialog which allows selection of the protocol
Set terminal address	Opens the *Terminal Address Dialog*
Calculate routes	Same as clicking on **Calculate Routes** on the *Toolbar*
Synchronize modem	Synchronizes the modem.

5.5 Menu Commands

Here are listed all the menu commands available in SATEL NMS PC Setup.

Note that all menu commands are not available at all times. Some commands require that a certain type of object is currently selected, on which the command will work on.

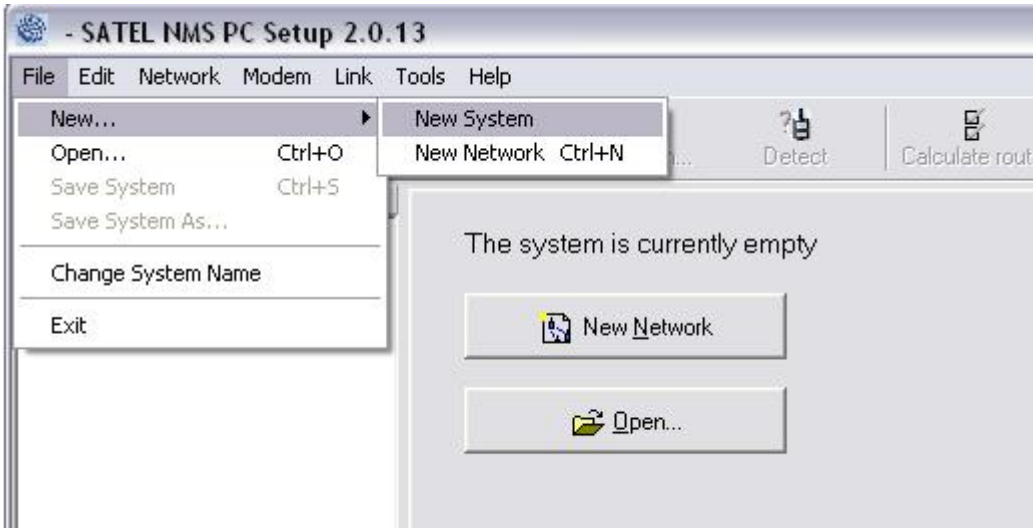


Figure 8: Menus

5.5.1 Context menu

The context-sensitive menu is accessed by right-clicking on the program. You will be presented with a list of menu commands depending on the selected object. All these commands also appear in the main menu.

5.5.2 File Menu

Location: Menu bar. Contains commands for manipulating files and objects

Menu Command	*Required selected object*	*Description*	*Other locations / keyboard shortcuts*
New->New System	*None*	Clear current system and create a new one. Will ask for user confirmation.	
New->New Network	*System/None*	Add a new empty network to the current system	*Empty system view*, Ctrl-N

New->New modem	*Network*	Add a new modem to the selected network. Initial modem settings are copied from the *default modem settings*.	*Design view, Context menu*, Ctrl-M
Open	*None*	Open an existing .sax file	*Empty system view, Toolbar*
Save System	*System with unsaved changes*	Save the system to the .sax file	Ctrl-S
Save System As…	*System*	Save the system to a new .sax file	
Change System Name	*System*	Change the name of the system. This name is independent from the .sax file name, although the .sax file name defaults to the system name.	
Exit	*None*	Exit the program. If there are unsaved changes, will ask user for confirmation.	*Alt-F4*

5.5.3 Edit menu

Location: Menu bar.

Menu Command	*Required selected object*	*Description*	*Other locations / keyboard shortcuts*
Copy	*Text*	Copy the currently selected text	Ctrl-c
Paste	*Text input field*	Paste text to input field	Ctrl-v
Preferences	*None*	Open the *Preferences dialog*	

5.5.4 Network menu

Location: Menu bar. Network-related commands.

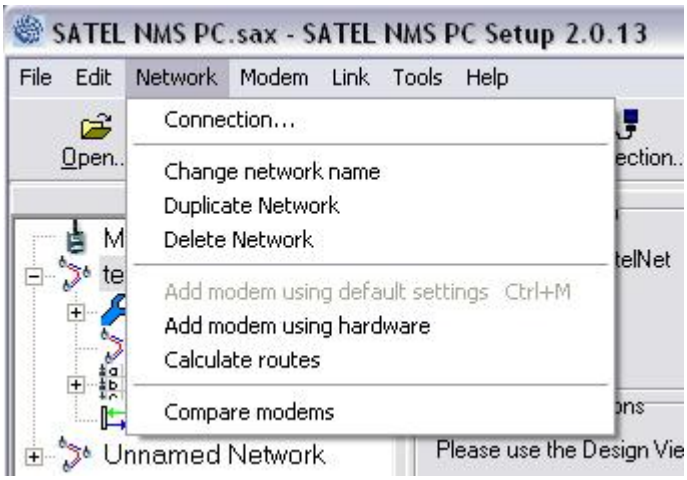


Figure 9: Network men

Menu Command	*Required selected object*	*Description*	*Other locations / keyboard shortcuts*
Connection…	*Network*	Open the *Connection dialog* to specify general connection settings for the current network.	*Toolbar*
Change network name	*Network*	Rename the selected network. Note that Network name is different from NetworkID. NetworkID is used as a "password" for communication between modems, while Network name is used to identify the network for users.	*Network Settings View*
Duplicate Network	*Network*	Creates a new network in the system and copies all settings, modems and links from this network to it. Useful as backup and when defining redundant networks.	
Delete Network	*Network*	Removes the selected network from the system	
Add modem using default settings	*Network*	Adds a new modem to the network and copies settings from the *Default modem settings* to it.	*Ctrl+M, Network design view*

Add modem using hardware	*Network*	Ask the user to connect modem hardware and adds the connected modem to the network.	*Network design view*
Calculate routes	*Network with changed routing settings*	Check to see if network settings are valid and generate routing tables for the master modem.	*Toolbar*
Compare modems	*Network with modems*	Shows all differences between the modem settings of all the modems in the network.	

5.5.5 Modem menu

Location: Menu bar. Modem related commands.

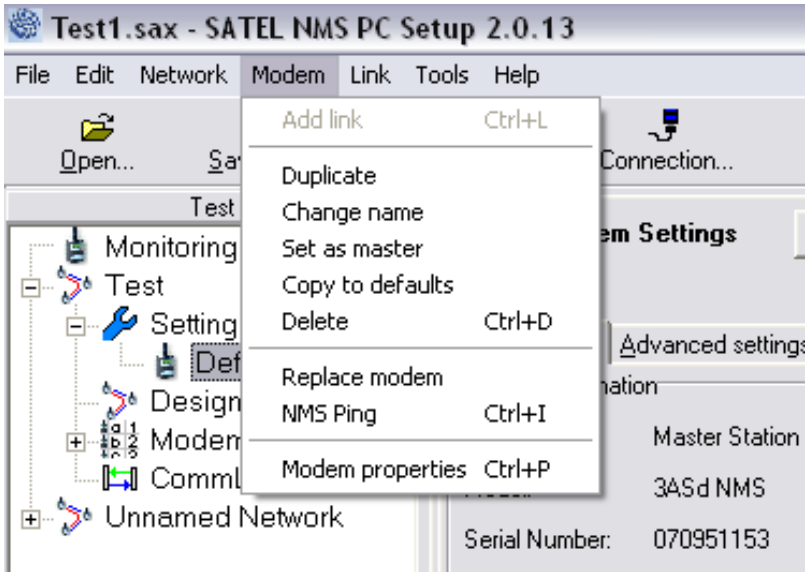


Figure 10: Modem menu

Menu Command	*Required selected object*	*Description*	*Other locations / keyboard shortcuts*
Add link	*Modem and at least two modems present in network. Only shown in* Network Design View.	Starts the link drawing mode. Click on the target modem. Link direction is automatic. If a link cannot be created, a message explaining the issue is shown.	*Context menu,* CTRL+L

		In case of problems, create links starting from the master modem first.	
Duplicate	*Modem*	Creates a new modem in the network and copies all settings from selected modem to the new modem.	
Change name	*Modem*	Renames the modem. This is the name shown on the LCD screen of the modems.	*Modem View*
Set as master	*Modem*	Makes the selected modem into network master. Will automatically set necessary settings in all modems, switch link directions and generate routing tables.	*Modem View*
Copy to defaults	*Modem*	Copy all settings from this modem into the default modem settings	
Delete	*Modem*	Removes the selected modem from the network	Ctrl+D
Replace modem	*Modem*	Used to replace the selected modem's currently associated hardware with other hardware. All settings are moved to the new hardware by synchronizing.	
NMS Ping	*Modem*	Starts the NMS Ping tool, using this modem's address.	Ctrl+I
Modem Properties	*Modem*	Shows the *Modem Settings View*	Ctrl+P

5.5.6 Link menu

Location: Menu bar. Link related commands.
NOTE: To select a link, go to *Network Design View* and click on the "/" character on the link arrow.

Menu Command	*Required selected object*	*Description*	*Other locations / keyboard shortcuts*
Delete link	*Link*	Removes the link	*Context menu*
Reverse	*Link*	Changes link direction	*Context menu*

5.5.7 Tools menu

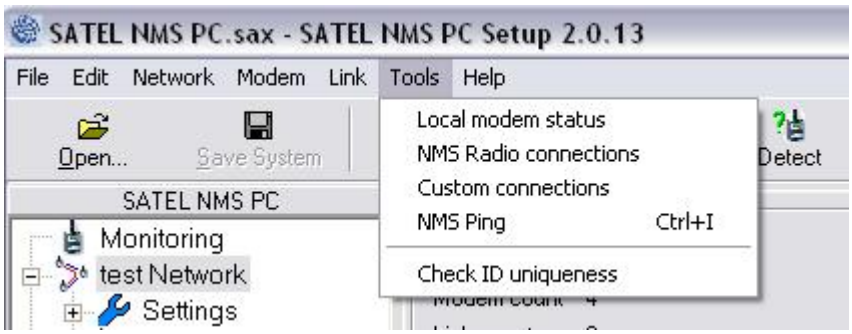


Figure 11: Tools menu

Menu Command	*Required selected object*	*Description*	*Other locations / keyboard shortcuts*
Local modem status	*Network*	This tool checks which modem is connected to the serial port and shows some information about it.	*Network info view*
NMS Radio connections	*Network*	This tool tries to contact all radio modems in the network by sending NMS messages through the master modem, and displays a report on which modems answered. This is a useful tool to check whether the modems have radio contact with each other.	*Network info view*

Custom connections	*Network*	Same as NMS radio connections, but uses the Custom connections in case they have been defined, otherwise uses the network's connection.	*Network info view*
NMS Ping	*Network*	Send several NMS messages to a single modem to test the radio link quality over. Reports RSSI and passed time.	*Network info view* Ctrl+I
Check ID uniqueness	*Network*	If you have defined duplicate networks using SATEL NMS PC Setup V2.0.3 or earlier, run this tool to fix a problem with the .sax file.	

5.5.8 Help menu

Menu Command	*Required selected object*	*Description*	*Other locations / keyboard shortcuts*
About	*None*	Display information about the program version and loaded SATELNMS.ID file version	

5.6 Toolbar

The toolbar contains some essential commands. These commands also appear in the menus.

Figure 12: Toolbar

Some commands appear grayed-out (inactive) if they cannot be executed at the moment. Refer to the table below for explanation.

Toolbar Command	*Active*	*Description*
Open	*Always*	Open an existing .sax file
Save System	*There are unsaved changes*	Save the system to the .sax file
Monitoring	*A Network has been created*	Open the *Monitoring settings view*.
Connection	*A Network has been selected*	Open the *Connection dialog* to change the connection settings of the selected network.
Detect	*A Network has been selected*	Try to detect if a radio modem can be contacted using the current connection settings.
Calculate routes	*A Network has been selected and there are changes to routing settings*	Check to see if network settings are valid and generate routing tables for the master modem. NOTE: Always click "Calculate routes" after making changes to links between modems or terminal addresses in modems and follow the TODO list to take the new settings into use.

5.7 Setup views

Here you'll find all the different views of the setup program explained. The views appear in the *View Area* of the *Main Window*. See 5.3

5.7.1 Empty system view

This view is shown when no networks are present in the system. This view is reached by

- Starting the program (if autoload option is not on)
- Creating a new system (File->New->New System)

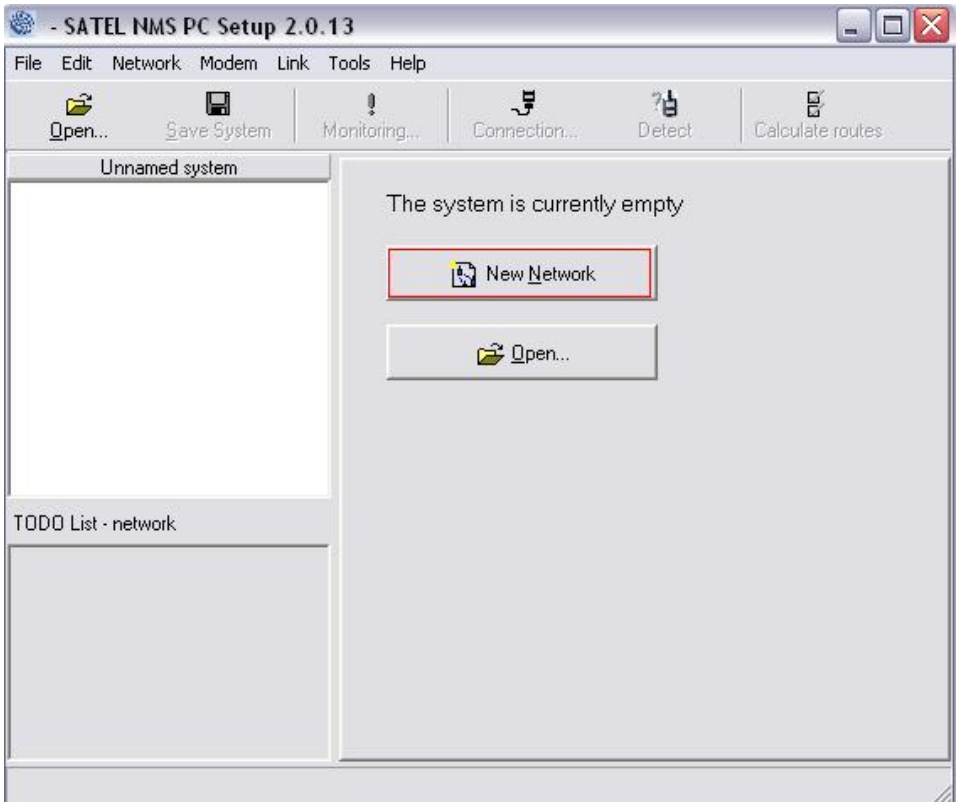


Figure 13: Empty system view

Options in this view:

Option	*Explanation*
Create a new network by clicking **New Network**	A system contains one or more Networks. A network contains modems. You need at least one network in the system to be able to work with modems.
Open an existing system file by clicking **Open…**	If You have an existing .sax file, you can open it.

5.7.2 Network info view

This view is shown when you click on the network root node on the *System Tree View*. The root node is the node immediately below "Monitoring" and the text of the node is the network's name.

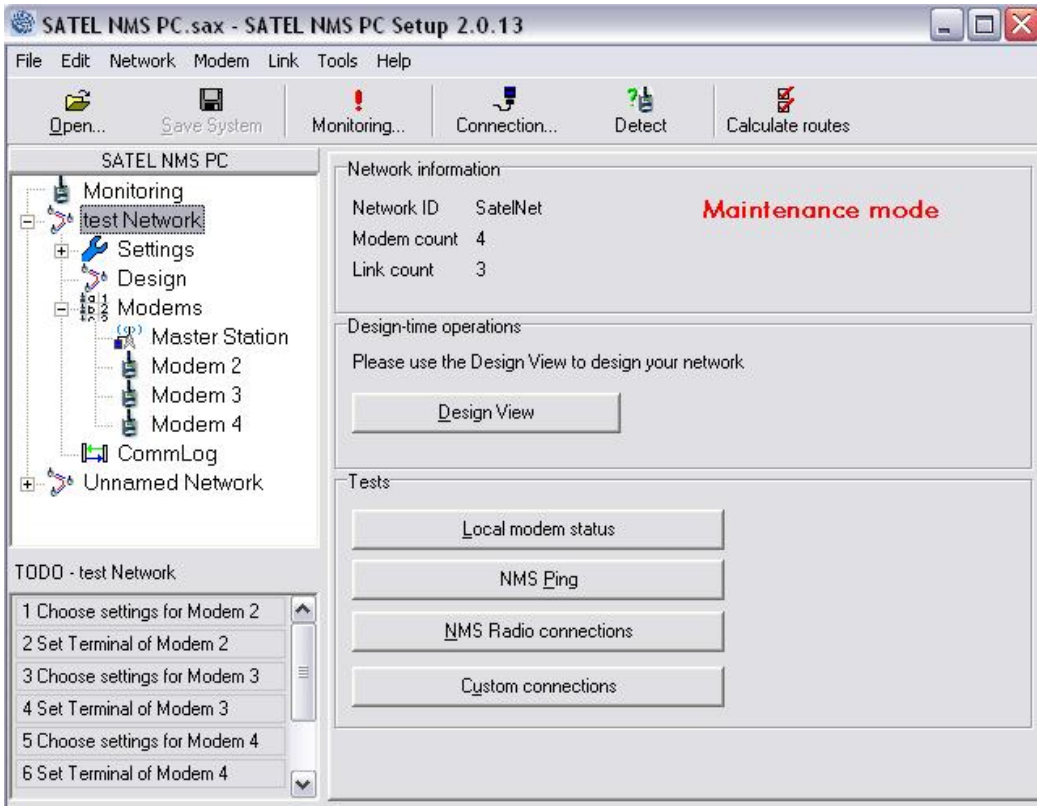


Figure 14: Network info view

Options in this view:

Option	*Explanation*
View Network information	Basic info about the network is shown.
Design-time operations	Click **Design View** button to go the *Network design view*
Perform some tests by clicking on buttons in the *Tests* group box.	See 5.5.7 for explanation of the tests.
Perform *Post-deployment operations*.	You can add a modem or replace a modem. See 5.5.4

5.7.3 Network settings view

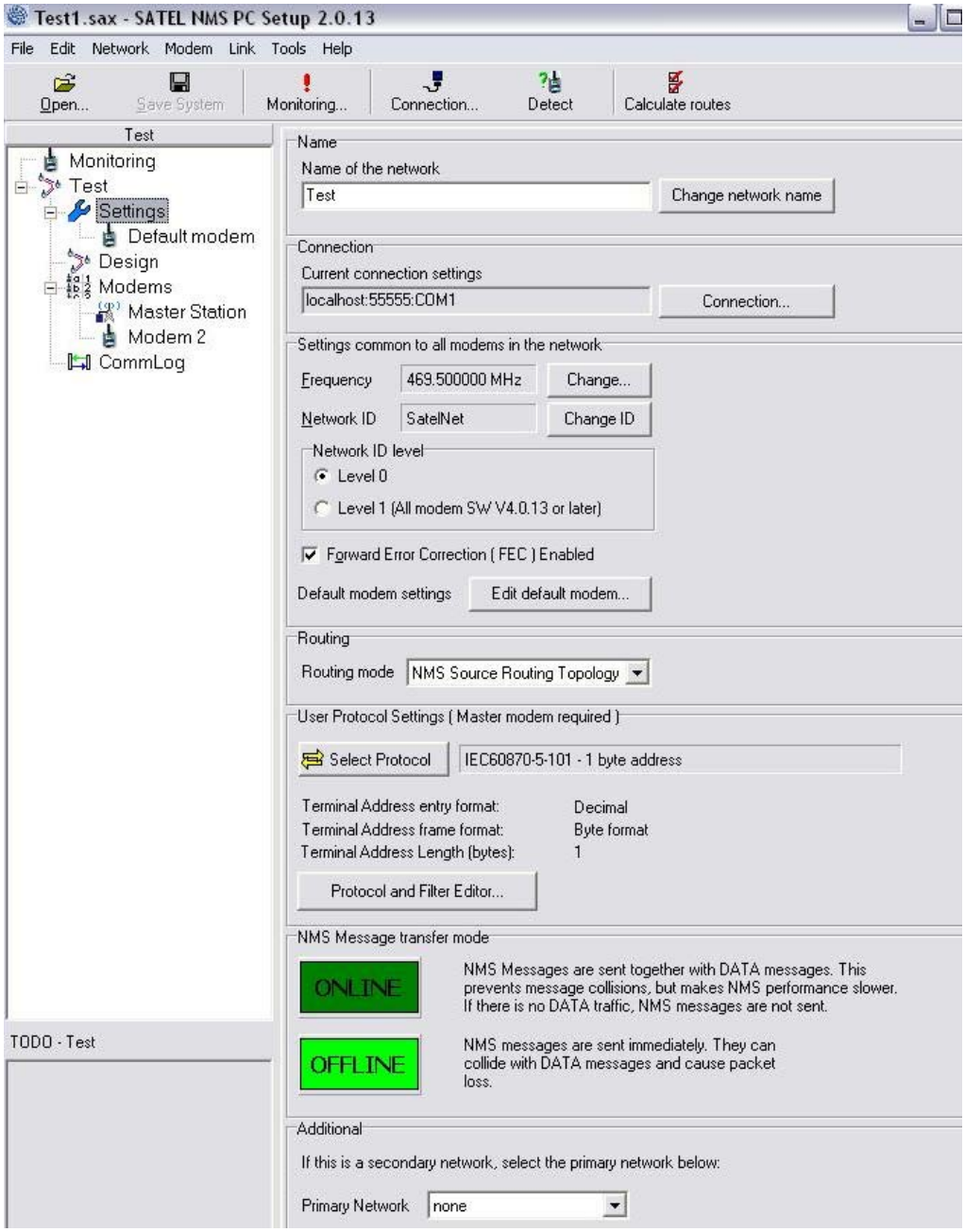

Test1.sax - SATEL NMS PC Setup 2.0.13
File Edit Network Modem Link Tools Help
Open... Save System Monitoring... Connection... Detect Calculate routes
Test
Monitoring
Test
Settings
Default modem
Design
Modems
Master Station
Modem 2
CommLog
TODO - Test
Name
Name of the network
Test
Change network name
Connection
Current connection settings
localhost:55555:COM1
Connection...
Settings common to all modems in the network
Frequency 469.500000 MHz Change...
Network ID SatelNet Change ID
Network ID level
Level 0
Level 1 (All modem SW V4.0.13 or later)
Forward Error Correction (FEC) Enabled
Default modem settings Edit default modem...
Routing
Routing mode NMS Source Routing Topology
User Protocol Settings (Master modem required)
Select Protocol IEC60870-5-101 - 1 byte address
Terminal Address entry format: Decimal
Terminal Address frame format: Byte format
Terminal Address Length (bytes): 1
Protocol and Filter Editor...
NMS Message transfer mode
ONLINE
NMS Messages are sent together with DATA messages. This prevents message collisions, but makes NMS performance slower. If there is no DATA traffic, NMS messages are not sent.
OFFLINE
NMS messages are sent immediately. They can collide with DATA messages and cause packet loss.
Additional
If this is a secondary network, select the primary network below:
Primary Network none

Figure 15: Network settings view

The view is divided into parts (group boxes)

Group box	*Explanation*
Name	You may set the network's name. The name is shown in SATEL NMS PC Setup and Monitoring applications, and their logs, but is not saved into any modems.
Connection	The network's connection settings. This connection is the default connection, where the master modem is assumed to be connected while monitoring or remote administration is performed. Other modems can be connected temporarily to this connection while they are being synchronized. Click on the Connection button to change the settings. (This will open the Connection Settings dialog)

Settings common to all modems in the network	This group box controls settings which are common to all modems of the network. When these values are changed, all modems need to be synchronized again. Additionally, these values cannot be changed through radio connection (except default modem settings), they need to be changed by synchronizing each modem using a serial cable. **Frequency** — Shows the currently set frequency- Click Change… to open the Frequency dialog and modify the frequency **Network ID** — This is the "password" of the network. All modems in a network must have the same NetworkID, in addition to Frequency and FEC mode, to be able to communicate. **Network ID level** — This choice is not shown if the modem does not support Network ID levels. If all your modems are V4.0.13 or later, set level to 1 for additional protection. **Forward error correction (FEC)** — Controls the FEC setting. FEC can give better sensitivity, with a little longer communication delays. See your modem manual for details. **Default modem settings** — Access the "default modem settings" view, where you can set default values of various settings. The defaults are copied to each modem in the network. Click Edit default modem… to open the Modem Settings View
Routing	This selection should be left at NMS Source Routing Topology. Transparent topology will not allow full NMS radio message functionality while the network is transmitting data.
User protocol settings	Here you can select the protocol your system uses for data transfer. Click Select Protocol to open a dialog which allows you to select the suitable protocol. If your protocol does not appear in the list, you can use the Packet Filter editor to create one. Click Protocol and Filter Editor to access the Packet Filter editor SW. NOTE: This is very advanced configuration and SATEL are happy to help you with Protocol filter problems.
NMS Message Transfer mode	This selection affects how SATEL NMS PC Setup transmits NMS messages to the radio network while doing remote configuration. See 3.2.4.1 for explanation of ONLINE and OFFLINE modes. Note that this setting does NOT affect how SATEL NMS PC Monitoring transmits messages. That setting appears in the Monitoring Settings View.
Additional	Primary Network: Leave this setting as "none" unless you are defining a secondary (redundant) network, as explained in 5.2.4.

5.7.4 Network design view

You can open this view by clicking on "Design" in the *System tree view* or *Network info view*. This view is used to design your network.

You can add modems and radio links and view the network topology, addresses and routing tables. Modems are represented by icons, which can be moved. You can select multiple modems at the same time by dragging a selection box around them. This is useful for creating multiple links at the same time.

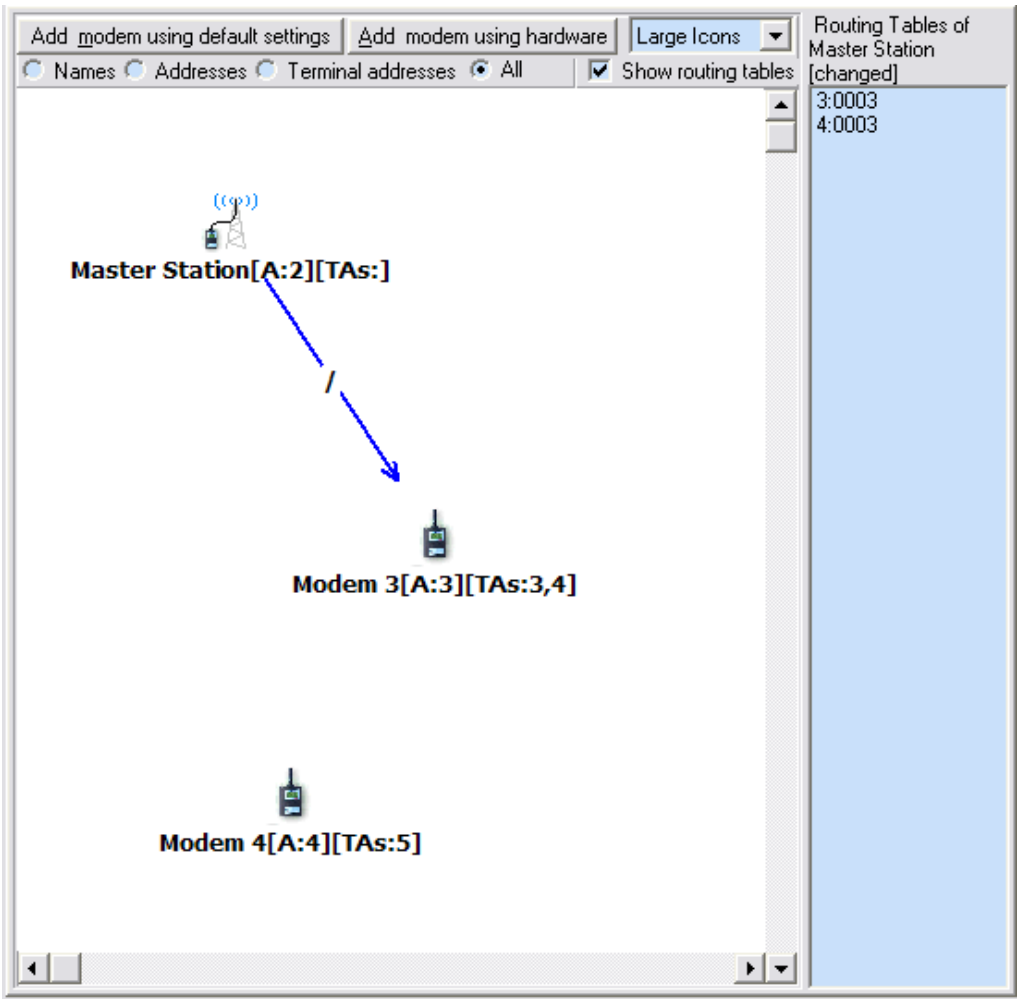


Figure 16: Network design view

Option	*Explanation*
Add modem using default settings	Add a new modem to the network, copying default settings from the default modem settings view.
Add modem using hardware	Connect your modem hardware and load all settings from the modem to the program. You should use this to add the first modem to a new network, because all the settings in it are copied to default modem settings and thereafter used for the rest of the modems. The TODO List will use this same function to add the first modem.
Large icons/small icons selection	Select one of two icon sizes for the modems.
Names/Addresses/Terminal addresses/All	Select what is shown in the text labels underneath the icons. The modem name is shown first [A:<number>] means the modem address [TAs:<numbers>] means all terminal addresses defined for the modem

Show routing tables checkbox	Shows/hides the routing table sidebar (right side of the view)
Network map	This shows the modems and links that have been defined. You can click on a modem to select it, after which you can perform operations on the selected modem. The operations are accessed through the Menu bar, Toolbar or the Context menu (right click). You can create a link or links by first selecting a modem or multiple modems (by dragging a selection box around them), then right-clicking the mouse to bring up the Context-menu. Select Add Link from the context menu: The link(s) appear and start following the mouse. Click on the modem you want to link to finish link creation. Clicking elsewhere will cancel link creation. Links point from the Master Modem toward the substations. Any modem which has both incoming and outgoing links becomes a repeater. Usually link direction is adjusted automatically. Sometimes a link cannot be created, in this case make sure other links point to correct directions, by Reversing them if necessary, and try again. You can select a link by clicking on the "/" character on it. Selected links can be reversed and deleted. Use the context menu (right-click). See also 5.5.6
Routing tables	This area can be brought up by selecting Show routing tables. The routing tables shown are the result of the latest Calculate routes operation. Routing tables are not uploaded into the master modem until it is synchronized. The text [changed] indicates that the routing tables have not been uploaded yet. You may make changes to the routing table by deleting and creating links. Since routing tables are only stored in the Master Modem (SATELLINE 3AS NMS and VHF using NMS Source Routing topology), substations and repeaters are completely unaffected by changes to the links. This makes it easy to try alternate routes if for example link quality is not good enough along some routes.

5.7.5 Modem list view

Clicking "Modems" in the *System tree view* opens the Modem list. This list shows all the modems of the network as a list, as well as some of their key properties. You can select modems on this list and perform menu commands on them.

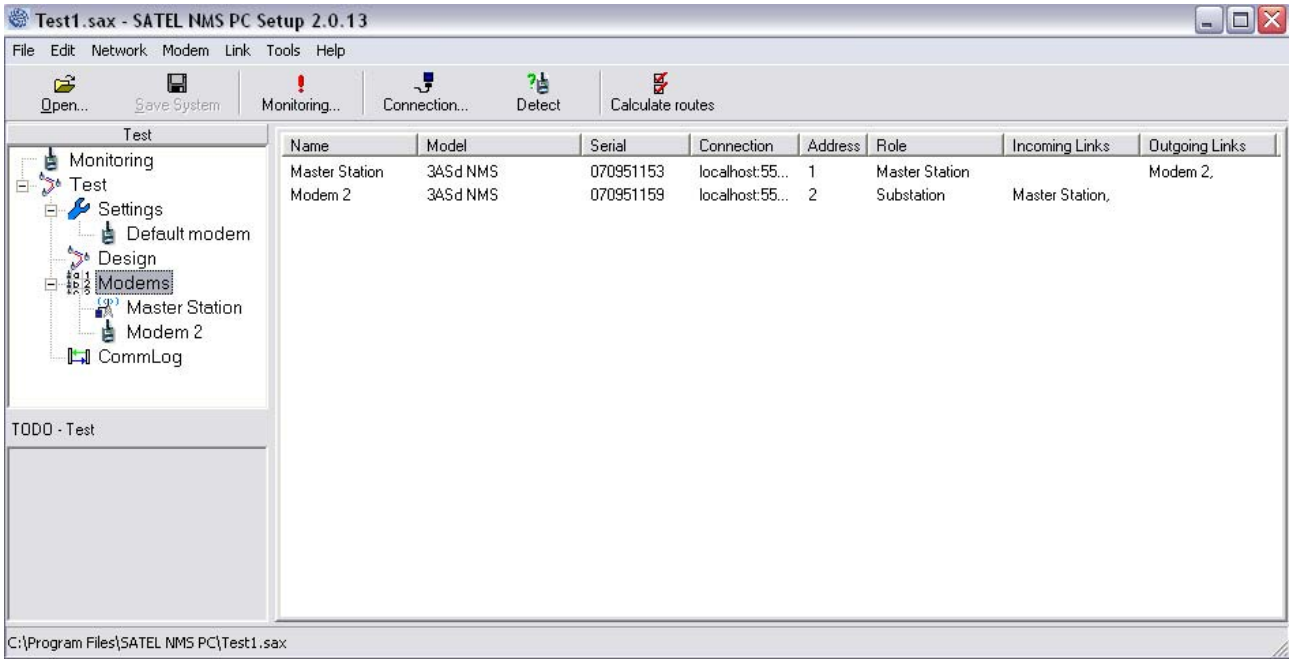

Test1.sax - SATEL NMS PC Setup 2.0.13
File Edit Network Modem Link Tools Help
Open... Save System Monitoring... Connection... Detect Calculate routes
Test
Monitoring
Test
Settings
Default modem
Design
Modems
Master Station
Modem 2
CommLog
TODO - Test
Name Model Serial Connection Address Role Incoming Links Outgoing Links
Master Station 3ASd NMS 070951153 localhost:55... 1 Master Station Modem 2,
Modem 2 3ASd NMS 070951159 localhost:55... 2 Substation Master Station,
C:\Program Files\SATEL NMS PC\Test1.sax

Figure 17: Modem list view

Modem List Column	*Explanation*
Name	Name of the modem
Model	Modem model, this information is read from the modem itself.
Serial	Serial number, read from the modem itself. If [unknown], the modem has never been synchronized and therefore its serial number is not known to SATEL NMS PC Setup. The software uses the serial numbers to associate specific modem hardware with their settings stored in the Setup program.
Connection	Shows which connection settings are used to contact the modem. This value is usually the same for all modems, unless Custom connections have been defined for some modems.
Address	The modem's NMS address. This is NOT a terminal address.
Role	The modem's role in a network; Either Master Station, Substation or Repeater.
Incoming links	List of modems which link to this modem.
Outgoing links	List of modems this modem links to.

5.7.6 Modem settings view

This view is shown when you select a modem on the *Tree system view* or double-click a modem on the *Network design view* or the *Modem list view*.

This view shows the settings of one modem. The settings are separated into three tabs:

- Basic settings
- Changes since last sync
- Advanced settings and control

There is also the **Synchronize** button which will read the modem settings and send any changes made in SATEL NMS PC Setup to it. The *Last sync date* label shows the time of the last synchronization of the modem.

5.7.6.1 Basic settings tab

The first page shows the most important settings of a modem.

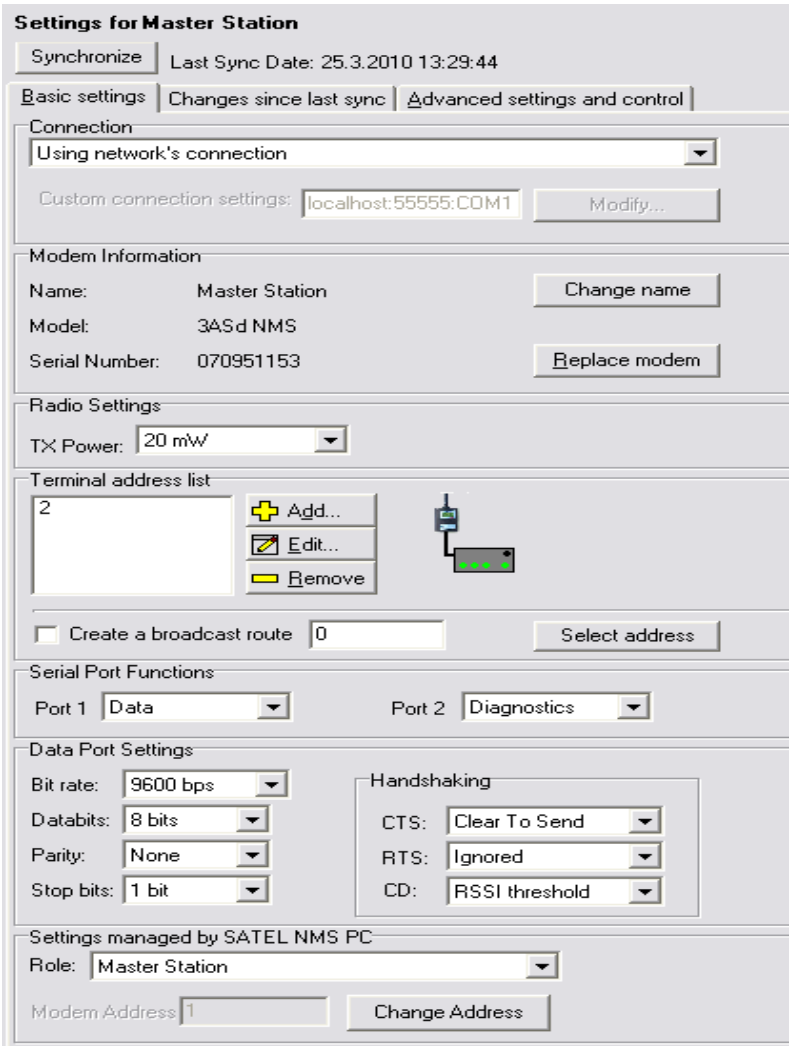


Figure 18: Modem settings view: Basic settings

Basic settings tab	*Explanation*
Connection	By default all modems are reached by the connection defined in network settings (Connection button in toolbar or in Network settings view). This means that when the modem is synchronized, it is either directly connected to the port defined in network connection, or the Master is connected to that port and the other modems are reached through the master by radio connection. If you wish to connect some modems directly to the PC by using a different connection, you can define a custom connection here.
Modem information	**Change name** button opens a dialog to change the modem's name. **Replace modem** is used to swap a broken modem for a spare. See 5.2.3
Radio settings	You can change the transmit power of the modem. If you select too low power for a deployed modem it might stop responding after being synchronized. In this case it will still receive messages provided the other modems in the path are transmitting with enough power, so you can switch the power back to a suitably high level and try synchronizing again.
Terminal address list	This area lists all addresses of user terminals connected to this modem's data port. This information is needed so that routing tables can be generated. Use **Add** to add a terminal. Select a terminal address in the list and click **Edit** or double-click it to edit the terminal address. Select a terminal address and click **Remove** to remove it. NOTE: Making changes to terminal addresses require **Calculate routes** and synchronizing the Master modem to become effective. The broadcast route is an advanced feature used in some data protocols; please contact SATEL for more information.
Serial port functions	You can select which port is the DATA port and which is the NMS (Diagnostics) port. Note that SATEL NMS PC Setup contacts the modem using the NMS port, unless the modem is in Prog mode or behind a radio link. This means if you change these settings and attempt to synchronize while not in prog mode, synchronize will refuse to change the settings, since if they were changed synchronization would fail due to communication being lost. Sync your modem in prog mode if you wish to change theses settings. See chapter 4.3 for more information.

Data port settings	These settings affect the selected DATA port. If Port 1 function is DATA, these affect port 1. If Port 2 function is DATA, these affect Port 2. See the Advanced… tab for settings of both ports if necessary. See your radio modem manual for details about serial port settings.
Settings managed by SATEL NMS PC	These settings are usually automatic, but nevertheless in some cases may need to be set manually. Role: Is the modem a Master Station, Repeater or Substation Modem address: The NMS Source routing address of the modem.

5.7.6.2 Changes since last sync tab

The second tab of *Modem settings view* shows the changes that have been made to the modem's settings since the last Synchronization of that modem. Here you can preview the changes before synchronizing them to the modem.

Note that in some cases a simple change to for example protocol or routing could generate many changes in this window. This is because SATEL NMS PC automatically calculates all necessary settings.

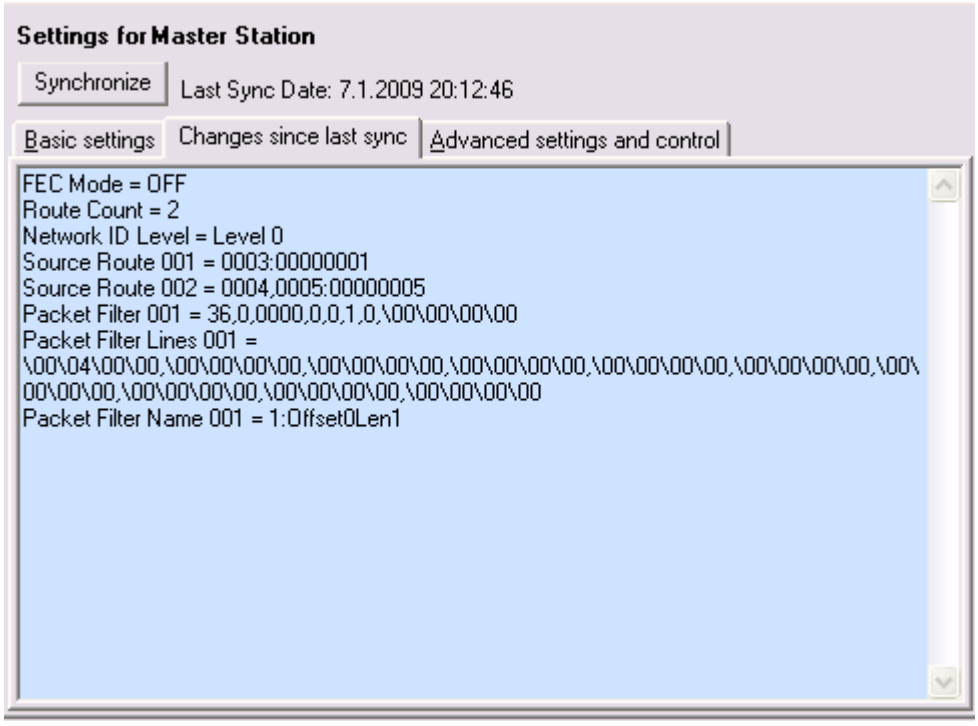

Settings for Master Station
Synchronize
Last Sync Date: 7.1.2009 20:12:46
Basic settings
Changes since last sync
Advanced settings and control
FEC Mode = OFF
Route Count = 2
Network ID Level = Level 0
Source Route 001 = 0003:00000001
Source Route 002 = 0004,0005:00000005
Packet Filter 001 = 36,0,0000,0,0,1,0,\00\00\00\00
Packet Filter Lines 001 =
\00\04\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00,\00\00\00\00
Packet Filter Name 001 = 1:Offset0Len1

Figure 19: Modem settings view: Changes since last sync

5.7.6.3 Advanced settings and control tab

The final tab, *Advanced settings and control* shows ALL available modem settings, including basic settings, and allows you to modify, send and receive them from the modem individually and immediately without synchronizing. Note that to make changes permanent, the Save settings command must be given to the modem. **Synchronize** does this automatically for you, but if you use **Send selected** to change values, you must give the **Save settings** command yourself. If you **Reset** or power down the modem, all settings not saved are returned to their previously saved values. To get up-to-date settings visible on the *Advanced settings and control* list, use **synchronize** immediately after a reset.

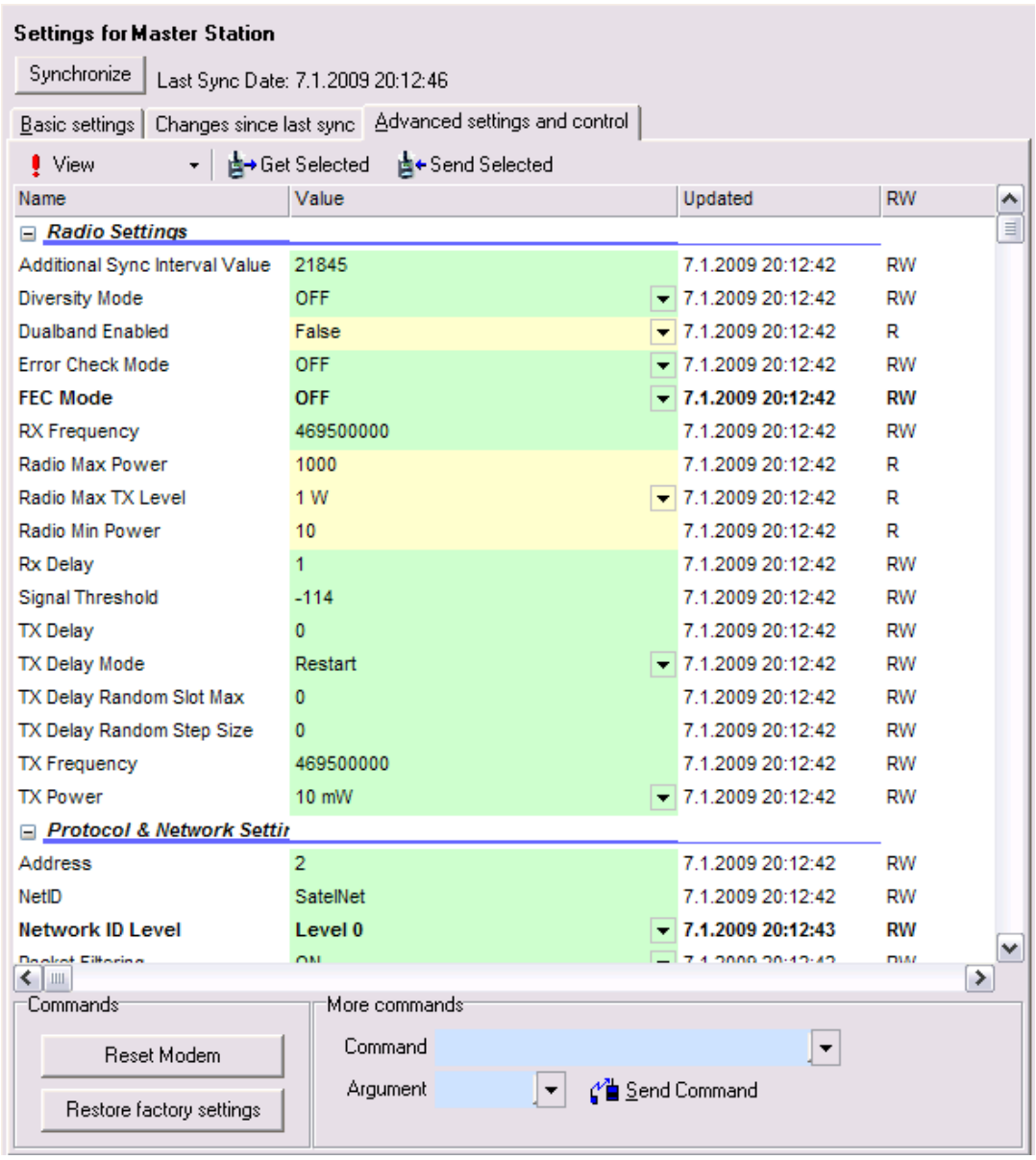

Settings for Master Station
Synchronize
Last Sync Date: 7.1.2009 20:12:46
Basic settings
Changes since last sync
Advanced settings and control
View
Get Selected
Send Selected
Name
Value
Updated
RW
Radio Settings
Additional Sync Interval Value 21845 7.1.2009 20:12:42 RW
Diversity Mode OFF 7.1.2009 20:12:42 RW
Dualband Enabled False 7.1.2009 20:12:42 R
Error Check Mode OFF 7.1.2009 20:12:42 RW
FEC Mode OFF 7.1.2009 20:12:42 RW
RX Frequency 469500000 7.1.2009 20:12:42 RW
Radio Max Power 1000 7.1.2009 20:12:42 R
Radio Max TX Level 1 W 7.1.2009 20:12:42 R
Radio Min Power 10 7.1.2009 20:12:42 R
Rx Delay 1 7.1.2009 20:12:42 RW
Signal Threshold -114 7.1.2009 20:12:42 RW
TX Delay 0 7.1.2009 20:12:42 RW
TX Delay Mode Restart 7.1.2009 20:12:42 RW
TX Delay Random Slot Max 0 7.1.2009 20:12:42 RW
TX Delay Random Step Size 0 7.1.2009 20:12:42 RW
TX Frequency 469500000 7.1.2009 20:12:42 RW
TX Power 10 mW 7.1.2009 20:12:42 RW
Protocol & Network Settir
Address 2 7.1.2009 20:12:42 RW
NetID SatelNet 7.1.2009 20:12:42 RW
Network ID Level Level 0 7.1.2009 20:12:43 RW
Commands
Reset Modem
Restore factory settings
More commands
Command
Argument
Send Command

Figure 20: Modem settings view: Advanced settings and control

UI element	*Explanation*
View button/menu	Select which settings you wish to display, and which columns appear on the grid. o User: Shows all user level NMSIDs (Access level 1) o Maintenance: Shows access level 5 NMSIDs o Factory: Shows access level 9 NMSIDs Note that only level 1 settings may be changed. o Categories: Sort settings into categories, such as Radio settings and Port settings. If this is disabled, all settings appear as a single list Columns available: o Name: Name of the setting o ID: NMSID of the setting o Value: Current value. If **Bold,** it has been changed o Type: Data type of the setting o Updated: When was it last received from the modem o RW: Is it readable and/or writable. Write-only settings are commands o Previous value. The value before it was changed
Get selected button	You may select a setting by clicking on its Name. By holding down SHIFT or CTRL, you may select multiple values. Click this button to load all selected settings from the modem
Send selected button	Click this to send all selected settings to the modem. They usually take effect immediately. Some settings may require an Init Radio or Reset before they take effect. See modem manual for details. Note that the settings must be Saved to modem non-volatile memory to become permanent. If they have not been saved, they are lost when the modem is reset.
Settings grid	The Grid shows the settings. Columns may be selected from the **View** button/menu. Settings may be sorted by clicking the column headers. Settings may be edited by clicking in the Value column. Green settings may be edited, yellow settings are read-only. If red settings appear, you need to update your software to a newer version. When you edit values, either a selection list opens, or you may type in the new value. In case of typing, *press the Enter key to finish editing*, otherwise the change is canceled. Changed settings are shown in **Bold**.
Commands	**Reset modem** button sends the reset command to the modem. All unsaved changes are lost.

	Restore factory settings will return the modem settings back to factory defaults. Using this command may cause the modem to stop responding to radio messages, until it is re-added to the network and synchronized using the serial cable.
More Commands	Select a command from the Command selection list, then select argument (usually Yes or True), and finally click **Send Command**. The Command selection list depends on the modem model, but usually contains at least the "Save user settings" command which can be used to save the settings previously sent to the modem using **Send selected** so that they are permanently stored in the modem's non-volatile memory (Flash or EEPROM depending on modem model)

5.7.7 Commlog view

This view shows NMS message traffic to and from the modems of this network. Only SATEL NMS PC Setup traffic is shown here, other programs have their own message logs.
The log text can be selected using Ctrl-A and copied to the clipboard using Ctrl-C. In case you are contacting SATEL for help with communication problems, the log text could be helpful.

5.8 Windows and dialogs

5.8.1 Connection settings window

This window is shown when SATEL NMS PC Setup requires you to define the communication settings to reach a Modem's NMS Protocol Port.

When this window is shown, usually the best way to proceed is to click **Detect available COM ports**, select a port form the list, and click **Test connection**, followed by OK if the test was successful (Modem detected)

There are two tabs in this window, as well as some commands common to both tabs. All the settings in both tabs affect the connection, so for example the test connection tool should be used after changing any setting to make sure the connection works.

The common buttons are explained below and the two tabs later.

UI element	Explanation
Test connection	Attempts to open the defined connection and queries the modem using NMS Protocol. The value requested is the serial number of the modem. If the test is successful, the serial number is shown beside the **Test connection** button, otherwise an error message, such as "Modem Timeout" is shown.
OK	Accept selected connection settings and close the window
Cancel or [X]	Close window without changing connection settings.

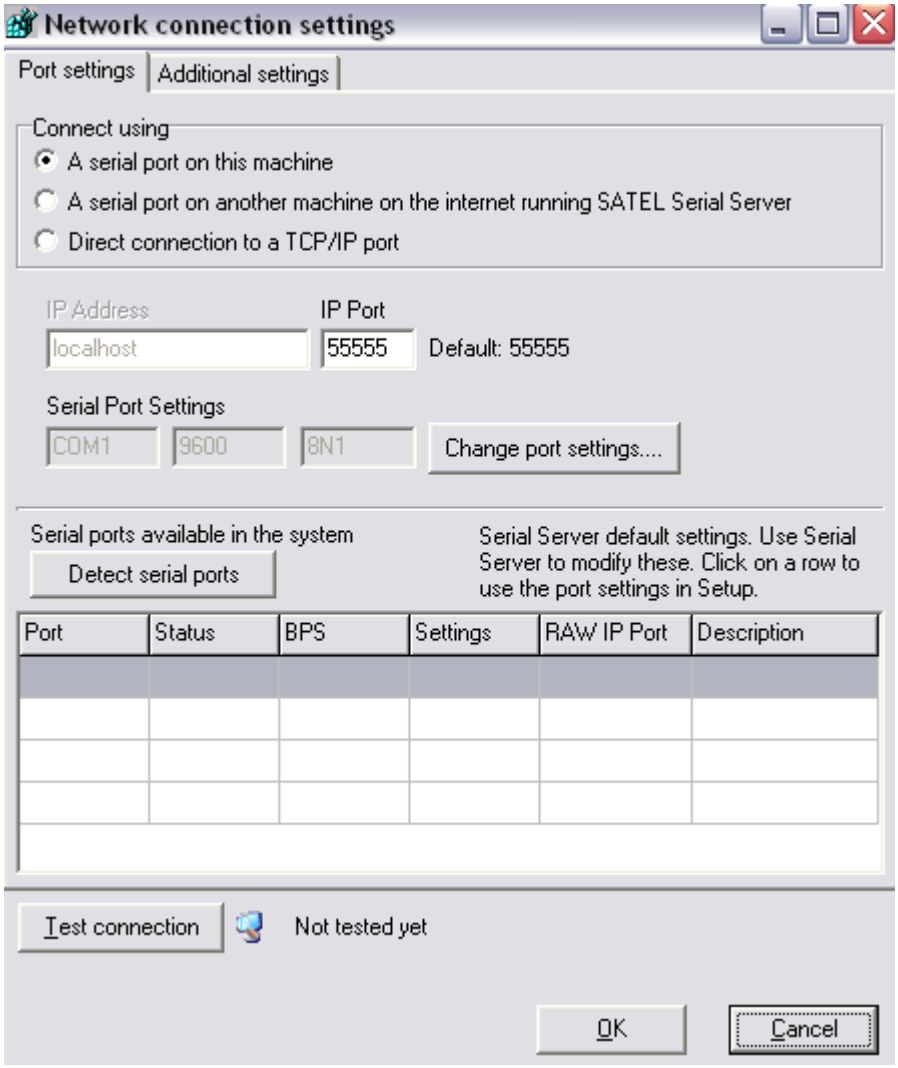


Figure 21: The Connection settings window showing Port settings tab.

5.8.1.1 Port settings tab

This tab controls the most common port settings.

UI element	*Explanation*
Connect using	Select connection method to use o A serial port on this machine: Normal RS-232 serial port, or nother serial port that appears to Windows as a COM port, such as a Virtual COM port or USB-to-serial adapter. (default) o A serial port on another machine … : As above, but the serial ports of another windows PC reachable using an internet protocol address may be used. Both above methods use SATEL Serial Server to access the serial ports. The first method automatically starts Serial Server when needed, while the second method requires that Serial Server is running in the target machine. o Direct connection to a TCP/IP port: If using a serial port server device or another method which allows direct access to an NMS port of a SATEL modem on a TCP/IP address, use this setting.
IP Address	The IP Address where SATEL Serial Server is hosted. If "Direct connection…" (see above) is used, the address of the NMS port.
IP Port	The TCP port where SATEL Serial Server is hosted. If "Direct connection…" (see above) is used, the TCP port of the Direct connection NMS port.
Serial port settings	Shows current serial port settings. Clicking on the Available COM ports list will change these values to those clicked. Click **Change port settings** to modify port settings. Also see *SATEL Serial Server settings view. (chapter 7.1)*
Change port settings	Opens *Port settings dialog,* allowing you to change port settings manually.
Available COM ports	This list shows all COM port devices installed into the machine. The list is read from the Windows registry by SATEL Serial server when **Detect available COM ports** is clicked.
Detect available COM ports	Lists available COM ports. Some serial port drivers have problems with this feature. In this case use the Change Port Settings button.

5.8.1.2 Additional settings tab

There are some additional settings in the Additional settings tab of the Connection settings window

UI element	*Explanation*
NMS Message sending mode	This is the same setting that appears also on Network settings view. If you are defining a custom connection, this is a separate setting. o Offline: Send messages immediately o Online: Wait for user data See 3.2.4.1for more information
Offline mode NMS message Timeout	Time in milliseconds after which a non-responding connection is closed. This applies both to SATEL Serial Server and Direct IP port connections. If you get "Timeout" or "No Response" errors, try increasing this value.
Online mode NMS message Timeout	In online mode the time a message takes to travel to and return from a substation depending on the total user polling cycle duration. The online mode timeout should be set to at least the user polling cycle duration plus time between polling cycles. If you see many "No response" messages, especially during monitoring, try increasing this value. See also 5.9
Host requires a password	If the serial port server requires a password, one may be configured here. o Trigger is a text, such as a password prompt, which SATEL NMS PC programs expect from the connection before they send the password. o Password is the password required to open a connection to the port This setting may only be used with the "Direct connection to a TCP/IP port" connection method on the main tab.

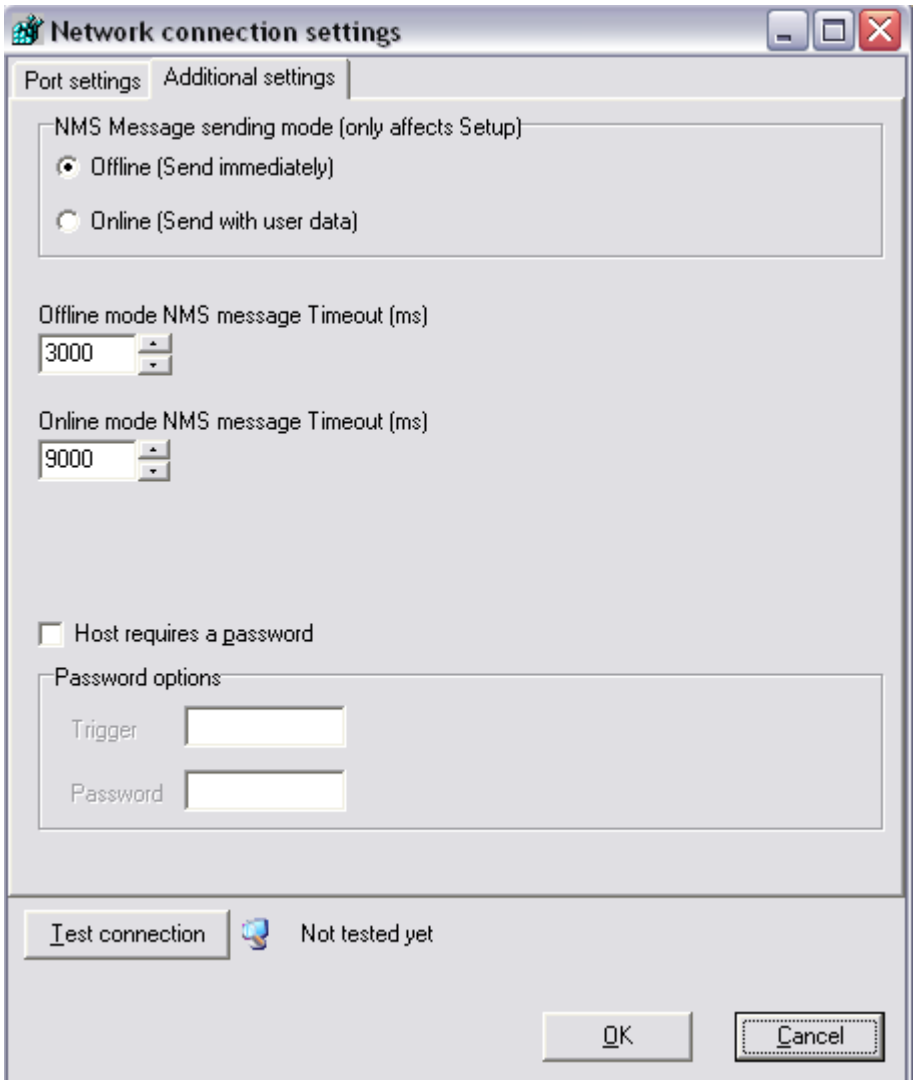


Figure 22: Connection settings window: Additional settings tab

5.8.2 Unknown modem address dialog

Unknown modem address
The modem hardware's serial number and address are unknown.
You should connect the modem hardware and click OK to continue.
If you need to connect to the modem remotely (radio connection), and know it's address, click the Set Address button.
OK
Set Address...
Cancel

Figure 23: Unknown modem address dialog

This is shown when you attempt to synchronize a modem for the first time, but the connected modem is already associated with another modem in SATEL NMS PC Setup. For example, you have just synchronized your master modem, and then click the Synchronize button of another modem, but the master modem is still connected.

- Recommended: Connect the other modem and click OK
- Alternative: If you wish to connect to the modem using radio and know its *modem address,* click **Set Address…**
- Click **Cancel** to abort whatever you were doing

5.9 Defining Monitoring Settings

The Monitoring Settings View (Figure 24) is used to define all monitoring settings, including the custom log file settings.

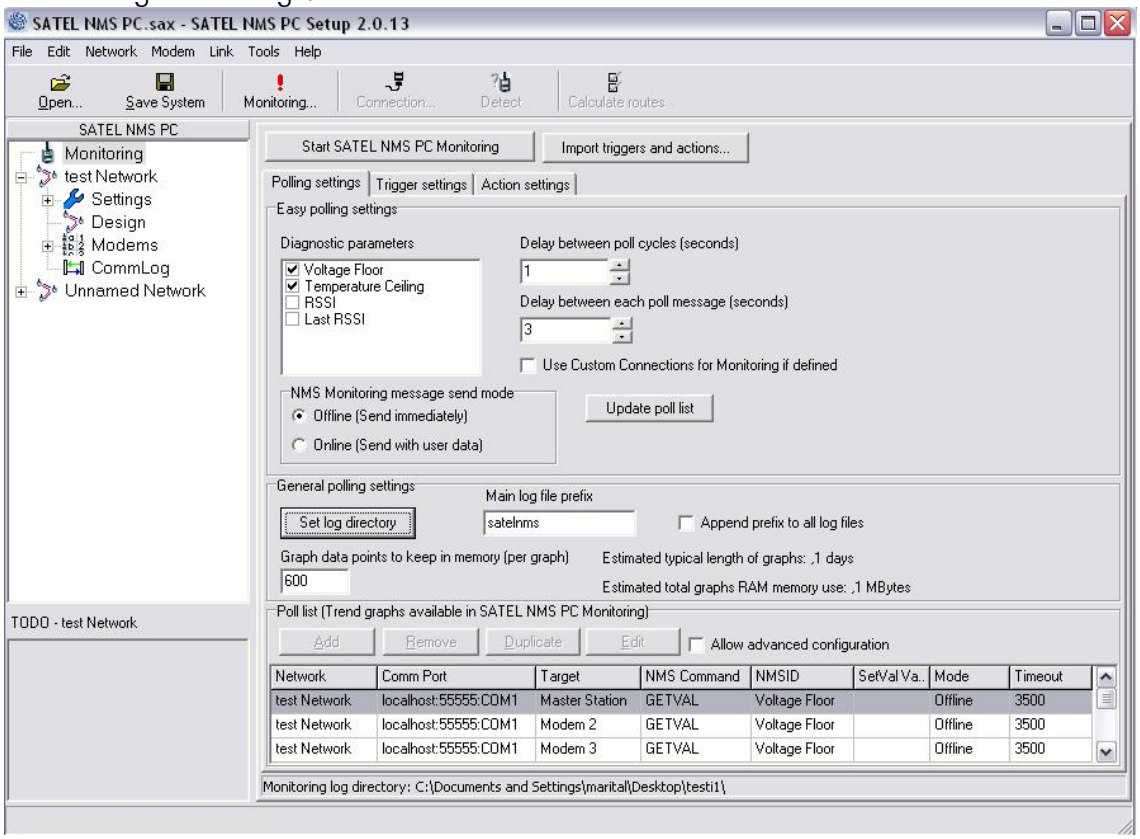

SATEL NMS PC.sax - SATEL NMS PC Setup 2.0.13
File Edit Network Modem Link Tools Help
Open... Save System Monitoring... Connection... Detect Calculate routes
SATEL NMS PC
Monitoring
test Network
Settings
Design
Modems
CommLog
Unnamed Network
TODO - test Network
Start SATEL NMS PC Monitoring
Import triggers and actions...
Polling settings
Trigger settings
Action settings
Easy polling settings
Diagnostic parameters
Voltage Floor
Temperature Ceiling
RSSI
Last RSSI
Delay between poll cycles (seconds)
1
Delay between each poll message (seconds)
3
Use Custom Connections for Monitoring if defined
NMS Monitoring message send mode
Offline (Send immediately)
Online (Send with user data)
Update poll list
General polling settings
Set log directory
Main log file prefix
satelnms
Append prefix to all log files
Graph data points to keep in memory (per graph)
600
Estimated typical length of graphs: ,1 days
Estimated total graphs RAM memory use: ,1 MBytes
Poll list (Trend graphs available in SATEL NMS PC Monitoring)
Add Remove Duplicate Edit
Allow advanced configuration
Network Comm Port Target NMS Command NMSID SetVal Va.. Mode Timeout
test Network localhost:55555:COM1 Master Station GETVAL Voltage Floor Offline 3500
test Network localhost:55555:COM1 Modem 2 GETVAL Voltage Floor Offline 3500
test Network localhost:55555:COM1 Modem 3 GETVAL Voltage Floor Offline 3500
Monitoring log directory: C:\Documents and Settings\marital\Desktop\testi1\

Figure 24: Monitoring settings view

UI Element	Purpose
Start SATEL NMS PC Monitoring Button	Start the Monitoring program using these settings. Asks to save the system if needed.
Import triggers and settings button	Import trigger and action settings from a different system file.
Log file directory button	This log file directory setting affects the directory where the **default** SATEL NMS PC Monitoring log files are stored. See Chapter 6 for more information.

NMS Message sending mode	This setting affects how SATEL NMS PC *Monitoring* will send NMS messages. o Use "offline" mode when there is no DATA traffic. o Use "online" mode when there is DATA traffic. See chapter 3.2.4 NMS Protocol for more information.

5.9.1 Polling Settings

In this tab (Figure 25) the polling settings are defined. The Poll List is a list of NMS messages sent to the network by the Monitoring program to gather network status information from the modems. This view allows you to define the Poll List.

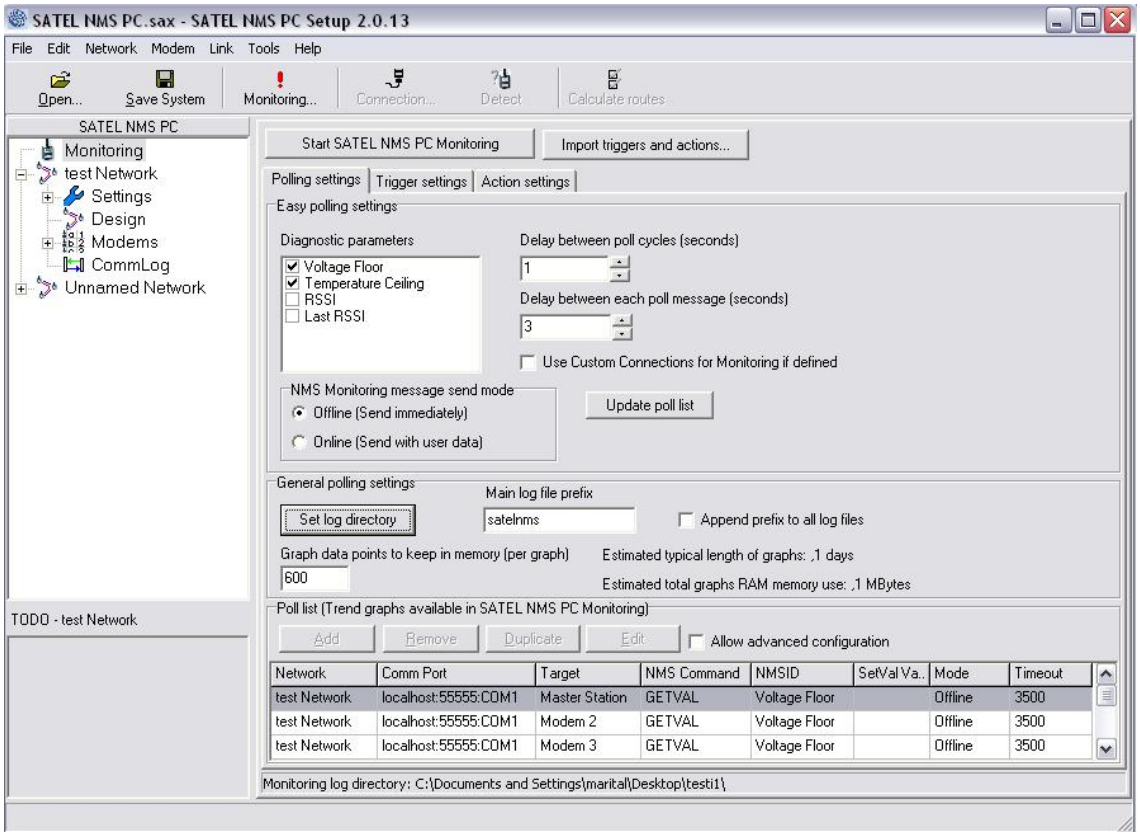

SATEL NMS PC.sax - SATEL NMS PC Setup 2.0.13
File Edit Network Modem Link Tools Help
Open... Save System Monitoring... Connection... Detect Calculate routes
SATEL NMS PC
Monitoring
test Network
Settings
Design
Modems
CommLog
Unnamed Network
TODO - test Network
Start SATEL NMS PC Monitoring
Import triggers and actions...
Polling settings Trigger settings Action settings
Easy polling settings
Diagnostic parameters
Voltage Floor
Temperature Ceiling
RSSI
Last RSSI
Delay between poll cycles (seconds)
1
Delay between each poll message (seconds)
3
Use Custom Connections for Monitoring if defined
NMS Monitoring message send mode
Offline (Send immediately)
Online (Send with user data)
Update poll list
General polling settings
Set log directory
Main log file prefix
satelnms
Append prefix to all log files
Graph data points to keep in memory (per graph)
600
Estimated typical length of graphs: ,1 days
Estimated total graphs RAM memory use: ,1 MBytes
Poll list (Trend graphs available in SATEL NMS PC Monitoring)
Add Remove Duplicate Edit
Allow advanced configuration
Network Comm Port Target NMS Command NMSID SetVal Va.. Mode Timeout
test Network localhost:55555:COM1 Master Station GETVAL Voltage Floor Offline 3500
test Network localhost:55555:COM1 Modem 2 GETVAL Voltage Floor Offline 3500
test Network localhost:55555:COM1 Modem 3 GETVAL Voltage Floor Offline 3500
Monitoring log directory: C:\Documents and Settings\marital\Desktop\testi1\

Figure 25: Polling settings view

5.9.1.1 Easy polling settings Groupbox

In this box polling settings can be defined in a simple and easy way. Changes done here will be reflected in the Poll List visible in the lower part of the view. A typical configuration is to select all three parameters in the "Diagnostic parameters" box. In the example configuration Modem Temperature and Voltage parameters are monitored, as well as link RSSI in both directions.

UI Element	Purpose
Diagnostic parameters Box	Select which parameters you wish to monitor (typically all)
Update Button	Updates the poll list. Click this if you have added or removed modems or changed the connections settings.
Delay between poll cycles	When all items in the list have been polled once, the polling is paused for this many seconds
Delay between each poll message	A new poll message is sent this many seconds after a response is received to the last message

5.9.1.2 Poll List Groupbox

This Groupbox shows the poll list and allows advanced configuration (not usually necessary)

UI Element	Purpose
Allow advanced configuration Checkbox	If unselected, use easy polling settings. If selected, easy polling settings become disabled and advanced controls (below) are enabled.
Add Button	Add an item to the poll list
Remove Button	Remove the selected item from the poll list
Duplicate Button	Duplicates the selected poll item. Note that duplicates are usually not useful as such and need to be edited.
Edit button	Edit the selected poll item. Opens the *Edit poll item dialog.*

5.9.2 Trigger Settings

The trigger settings tab shows defined triggers and allows adding, removing and editing triggers.

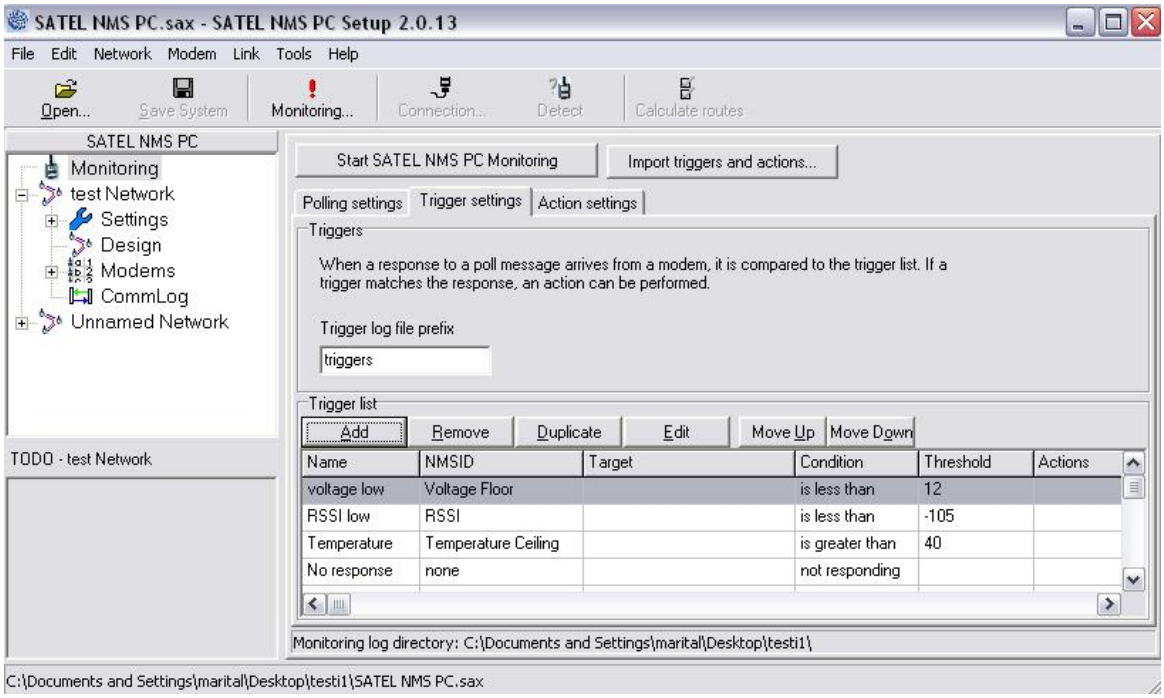


Figure 26: Trigger settings view

A Trigger specifies a condition which, if it exists in the network, will cause an Action to be executed and/or an alarm to be activated inside SATEL NMS PC Monitoring.

Every Diagnostic message (NMS message response) received as a response to a poll message from the modem network will be compared against all the defined Triggers. If a Trigger matches the response, the Action(s) specified in the Trigger is executed.

5.9.3 Editing a Trigger

When "Add" or "Edit" button in the Trigger settings tab is clicked, the *Trigger editing dialog* appears.

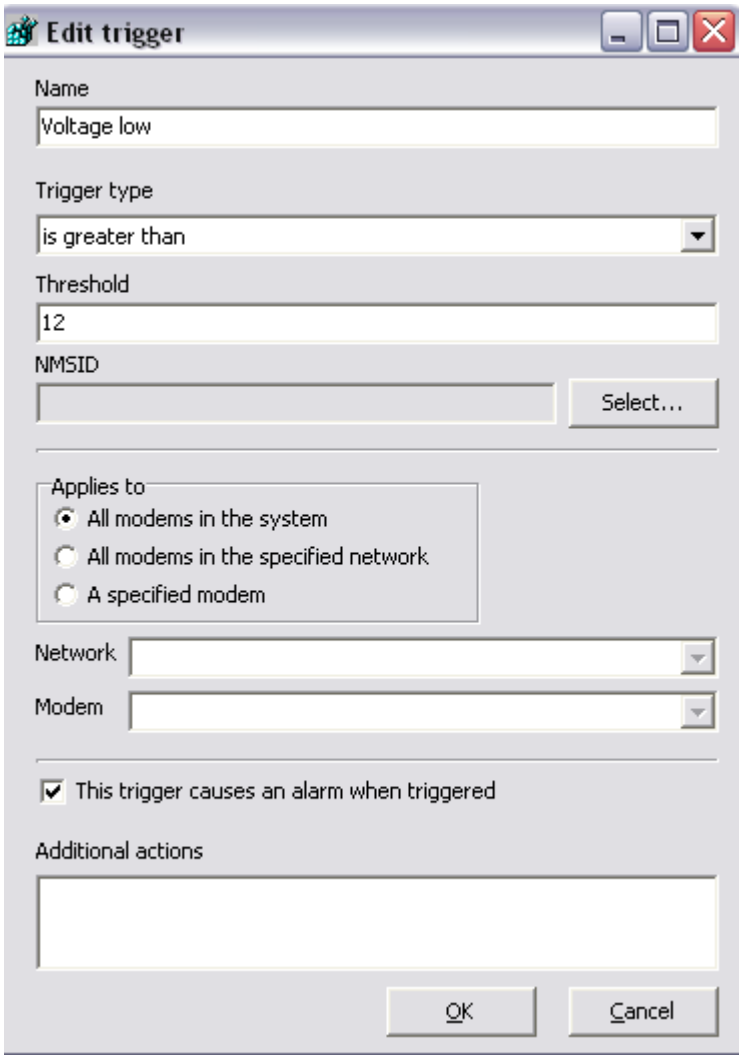


Figure 27: Trigger editing dialog

UI Element	Purpose
Name	This is a freely chosen string which is used to name the trigger.
Trigger type	This setting specifies what kind of comparison is made when the trigger is compared to a value received from the network

<table>
<tr><td></td><td>
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>not responding</td><td>The Trigger matches if an NMS query sent to the network does not receive a response. NMSID and Threshold are ignored in this case.</td></tr>
<tr><td>is less than</td><td>The Trigger matches if a received NMS Parameter has the same NMSID as this trigger AND the NMS value is less than the specified threshold</td></tr>
<tr><td>is greater than</td><td>The Trigger matches if a received NMS Parameter has the same NMSID as this trigger AND the NMS value is greater than the specified threshold</td></tr>
<tr><td>drops below</td><td>Same as “is less than” but only triggers once, not every time a value is received. If a value higher than threshold is received and then a lower value is again received the trigger triggers again.</td></tr>
<tr><td>raises above</td><td>Similar to “drops below” but for values that are higher than the threshold.</td></tr>
<tr><td>link breaks</td><td>If a modem does not respond this trigger triggers once, and will not trigger again until the modem has responded once and then fails to respond again.</td></tr>
<tr><td>link ok</td><td>If a modem did not respond to a message and then responds to another message, this trigger triggers.</td></tr>
</table>
</td></tr>
<tr><td>Threshold</td><td>A number the received value is compared to determine if the Trigger matches.</td></tr>
<tr><td>NMSID</td><td>The trigger is only compared to received values with the same NMSID as in the Trigger definition. Click the “Select” button to select the NMSID.
NOTE: A Trigger will never match if the same NMSID does not exist in the Poll List. (Because in that case the value is never received from the network)</td></tr>
<tr><td>Applies to</td><td>Which modems the trigger applies to.

It is usual to select all modems in the system, but in some cases it may be useful to match a trigger only to values received from a specific network or modem. For example, it may be permissible for some substations to reach temperatures of 40 degrees, but important repeaters and master modems must remain at 35 degrees or below. (Note: these are arbitrary numbers used as an example only.)

In these cases, specific triggers may be defined for each different case.</td></tr>
<tr><td>This trigger causes an alarm when triggered</td><td>This setting causes an alarm in SATEL NMS PC Monitoring when the Trigger matches. The alarm is shown in the alarms view of Monitoring, a red message is displayed in the window and an alarm log is written into the directory specified in chapter 6.</td></tr>
<tr><td>Additional Actions</td><td>Select all Actions that should be executed when the Trigger matches.</td></tr>
</table>

	NOTE: This list is empty until some Actions have been defined in the Actions tab of Monitoring Settings.

5.10 Action Settings

Action settings are defined in the Action settings tab (Figure 28)

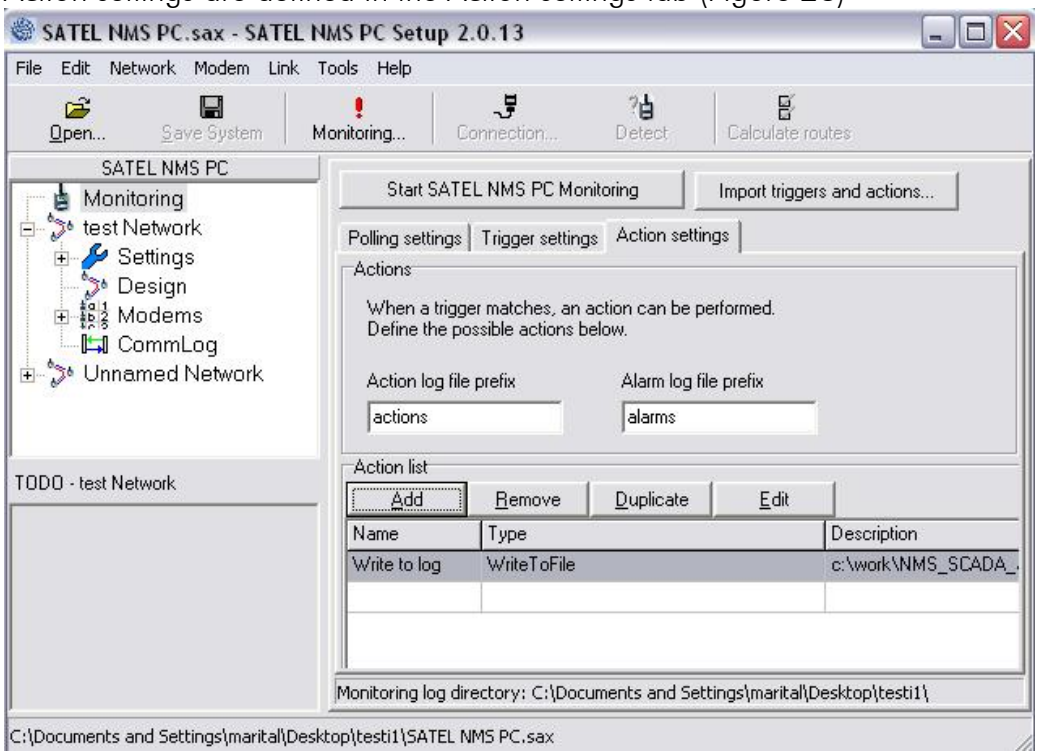


Figure 28: Action settings view

Similar to Triggers, Actions may be Added, Removed, Edited and Duplicated in this view using the buttons.

5.10.1 Adding an Action

When "Add" button in the Action settings tab is clicked, the *Action definition dialog* (Figure 29) appears. Note that if the "Edit" button is clicked the view is slightly different because the type of an action cannot be changed after it has been created.

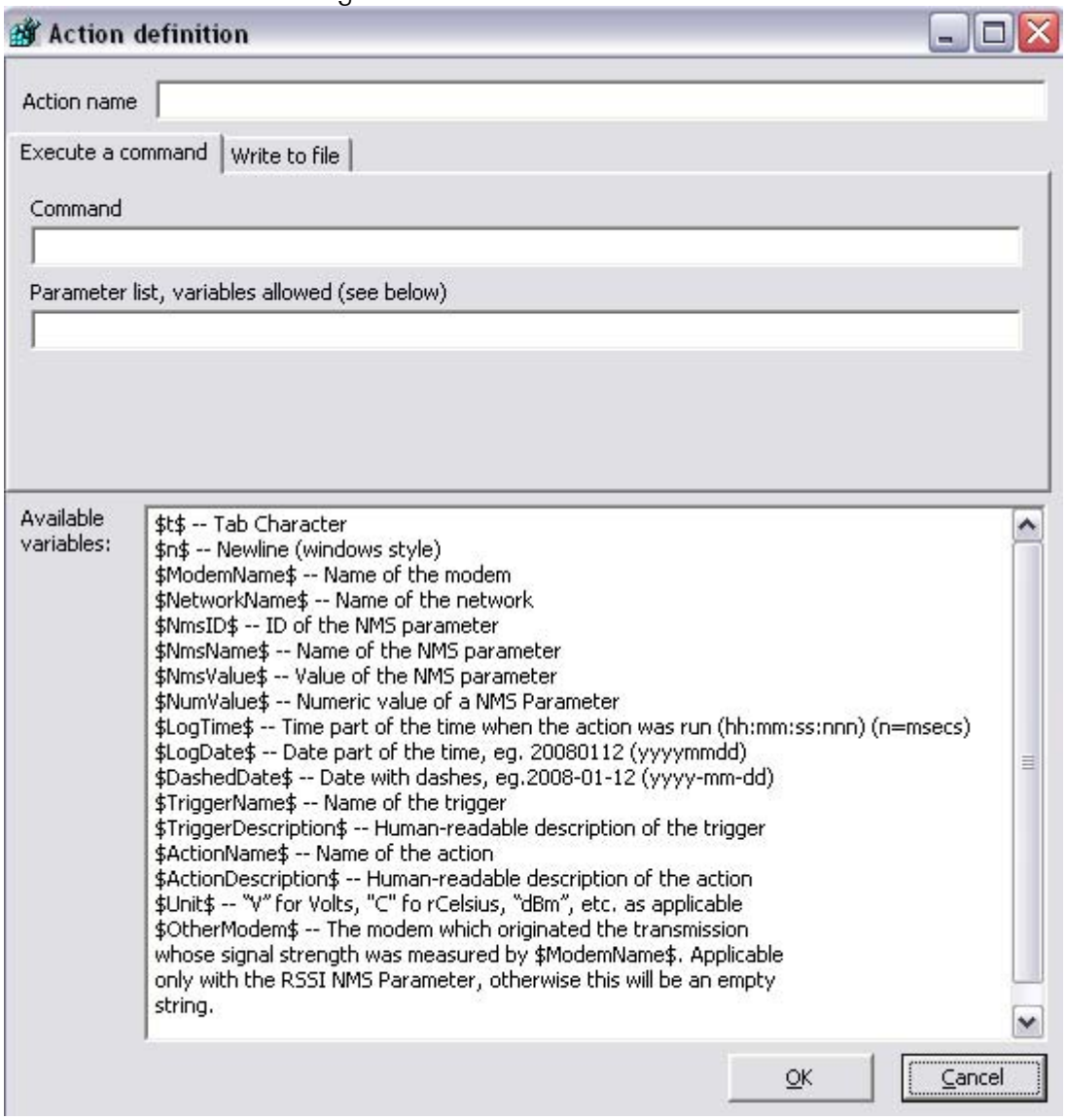

Action definition
Action name
Execute a command
Write to file
Command
Parameter list, variables allowed (see below)
Available variables:
t -- Tab Character
n -- Newline (windows style)
$ModemName$ -- Name of the modem
$NetworkName$ -- Name of the network
$NmsID$ -- ID of the NMS parameter
$NmsName$ -- Name of the NMS parameter
$NmsValue$ -- Value of the NMS parameter
$NumValue$ -- Numeric value of a NMS Parameter
$LogTime$ -- Time part of the time when the action was run (hh:mm:ss:nnn) (n=msecs)
$LogDate$ -- Date part of the time, eg. 20080112 (yyyymmdd)
$DashedDate$ -- Date with dashes, eg.2008-01-12 (yyyy-mm-dd)
$TriggerName$ -- Name of the trigger
$TriggerDescription$ -- Human-readable description of the trigger
$ActionName$ -- Name of the action
$ActionDescription$ -- Human-readable description of the action
$Unit$ -- "V" for Volts, "C" fo rCelsius, "dBm", etc. as applicable
$OtherModem$ -- The modem which originated the transmission whose signal strength was measured by $ModemName$. Applicable only with the RSSI NMS Parameter, otherwise this will be an empty string.
OK
Cancel

Figure 29: Action definition dialog

<table>
<tr><th>UI Element</th><th>Purpose</th></tr>
<tr><td>Action name</td><td>This is a freely chosen string describing the Action.</td></tr>
<tr><td>Tabs: Execute a command and Write to file</td><td>Select the action type by selecting the appropriate tab.
<table>
<tr><th>Tab</th><th>Description</th></tr>
<tr><td>Execute a command</td><td>A command line command is executed.</td></tr>
<tr><td>Write to file</td><td>A text string will be written into a file.</td></tr>
<tr><td>SATEL I-LINK control message</td><td>Not supported yet in SATEL NMS PC V2.0.11</td></tr>
</table></td></tr>
<tr><td>Filename</td><td>The full name, including path, of the file where the log line is written. The file will be opened, written into, and then closed immediately.</td></tr>
<tr><td>Line to insert into file</td><td>The text that will be written into the file. A Windows-standard line feed will be added automatically. The text may consist of any text and/or any number of the variables defined below.</td></tr>
<tr><td>Available variables</td><td>These variable names may be used on the Line field. The variable will be replaced by the appropriate value when the log line is written into the file.
<table>
<tr><th>Variable</th><th>Description</th><th>Examples</th></tr>
<tr><td>t</td><td>Tab Character.</td><td></td></tr>
<tr><td>n</td><td>Additional Newline (windows style linefeed)</td><td></td></tr>
<tr><td>$ModemName$</td><td>Name of the modem.</td><td>Master Station</td></tr>
<tr><td>$NetworkName$</td><td>Name of the network.</td><td>SCADA Demo Net</td></tr>
<tr><td>$NmsID$</td><td>ID of the NMS parameter.</td><td>1.86</td></tr>
<tr><td>$NmsName$</td><td>Name of the NMS parameter.</td><td>Voltage

Temperature Ceiling</td></tr>
<tr><td>$NmsValue$</td><td>Value of the NMS parameter.</td><td>28</td></tr>
<tr><td>$NumValue$</td><td>Numeric value Including the minus sign if the value is negative and a decimal point and an appropriate number of decimals if applicable.</td><td>12

-10.2

-105</td></tr>
<tr><td>$LogTime$</td><td>Time part of the time when the action was run. hh:mm:ss:msec</td><td>13:55:53:0354</td></tr>
<tr><td>$LogDate$</td><td>Date part of the time. yyyymmdd</td><td>20071030</td></tr>
<tr><td>$TriggerName$</td><td>Name of the trigger which executed this action.</td><td>Voltage Low</td></tr>
</table></td></tr>
</table>

	$TriggerDescription$	Human readable description of the trigger, including most of the other parameters.	
	$ActionName$	Name of the action.	*Write to log*
	$ActionDescription$	Human readable description of the action, including most of the other parameters.	
	$Unit$	The unit of the parameter in short form. Not all parameters have a unit, in this case the value is an empty string.	*V* *C* *dBm*
	$OtherModem$	The name of the modem which originated the transmission whose signal strength was measured by $ModemName$. Applicable only with the RSSI NMS Parameter, otherwise this will be an empty string.	Modem 2

6 SATEL NMS PC MONITORING

This chapter describes the SATEL NMS PC Monitoring program. At the beginning of the chapter there is an overview of the features and instructions for common tasks. Towards the end of the chapter all the windows and views of the program are explained.

6.1 Overview

The SATEL NMS PC Monitoring program is a separate executable intended to perform the following functions:

- Regular polling of diagnostics variables from a radio modem network using SATEL NMS Protocol
- Writing of monitoring logs (including traffic, trigger, action and custom logs)
- Displaying of trend graphs and other diagnostic information
- Executing actions based on the values of and changes in the diagnostic variables.

Monitoring cannot be used to make any changes to the network settings.

Since Monitoring is a separate executable, it can be run with different user privileges than the Setup program. In particular, it is usually a good idea to restrict access to Setup for certain key persons, while Monitoring can be installed to a wider user base. See chapter **Error! Reference source not found.** for more about installation.

6.2 Common tasks

6.2.1 Starting the program

Once you have a fully setup system created using SATEL NMS PC Setup and saved in a .sax file, you can start monitoring. Monitoring is started in one of two ways:

- From within SATEL NMS PC Setup, by clicking **Start NMS PC Monitoring** in the *Monitoring settings view*.
- By starting SATEL NMS PC Monitoring from the Windows shell (start menu, command line, shortcut etc).

In the latter case, you need to load the .sax file separately using the menu command File->Open.

If the .sax file name is given to Monitoring as a command line parameter, the file is loaded and monitoring is started automatically when the program starts.

If Windows is configured to log in automatically and a shortcut to Monitoring (including the .sax filename) is added to the Windows Startup folder, the program will be started automatically if and when the PC reboots.

6.2.2 Viewing diagnostics

In the Main window (chapter 6.3) you can select from the various available views

6.3 Main window

The main window has three main areas: The Main menu, The Alarm indicator and the View area.

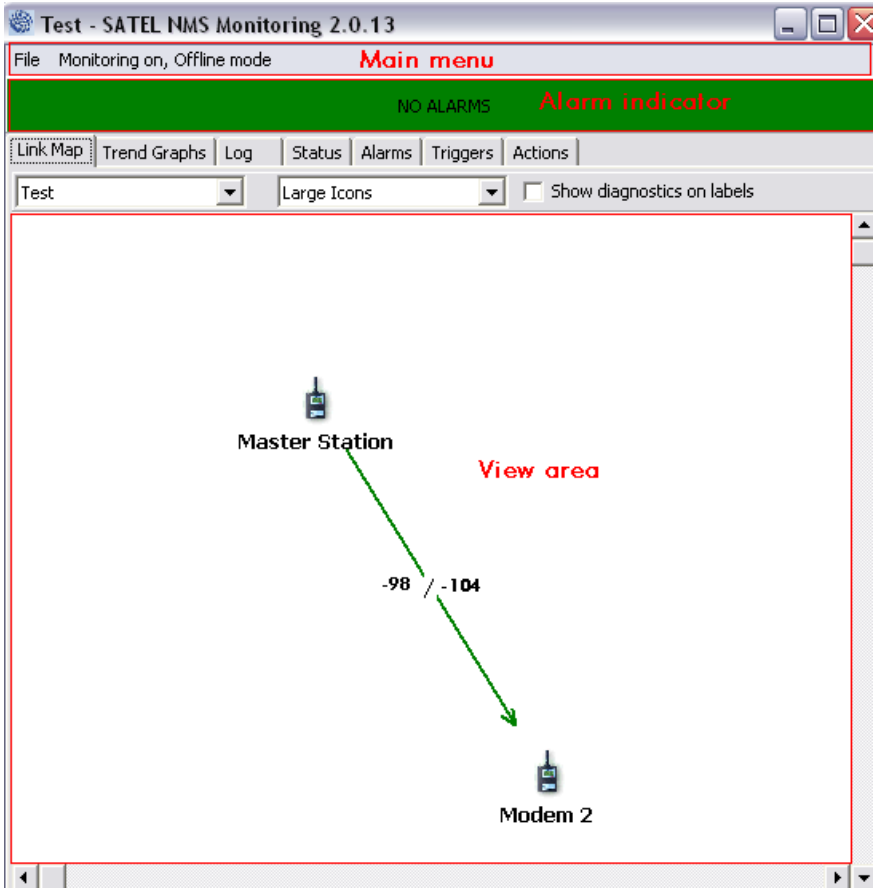


Figure 30: NMS PC Monitoring, Main window

Main window area	*Purpose*	*More information*
Main menu	Most commands appear in the menu. Some of the commands are also usable from the various views	See chapter Menu commands
Alarm indicator	If there are defined alarm conditions in the system and the Monitoring is ON, the Alarm indicator will turn bright red color in case an alarm happens. You can click on the Alarm indicator to show the alarms.	See chapter Alarms
View area	This area shows the currently selected view.	For information about the views, see chapter Monitoring views

6.4 Menu commands

Here are listed all the menu commands available in SATEL NMS PC Monitoring.

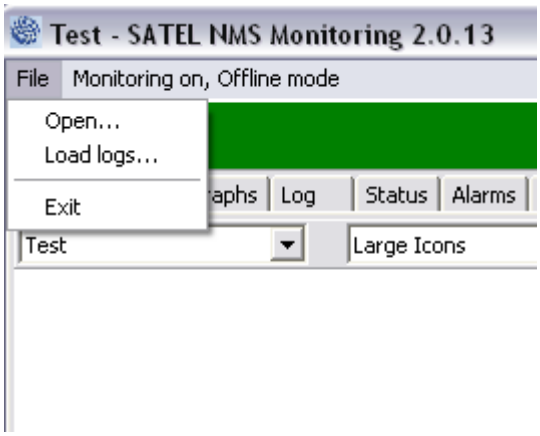


Figure 31: Monitoring Menus

6.4.1 File Menu

Location: Menu bar. Contains commands for manipulating files.

Menu Command	*Description*
Open…	Open a system (.sax) file
Load logs…	Load a value log (*Main* log file type) of Monitoring to display the diagnostic data contained in the log as a trend graph. Use this to access older trends which have been removed from the RAM memory of NMS PC Monitoring.
Exit	Stops monitoring and closes the program. Log files remain, but will **not** be loaded automatically the next time the SW s started, use Load logs… to see older monitoring data.

6.4.2 Monitoring menu

The name of this menu changes to indicate if monitoring is on or off. It also shows whether the NMS message transmitting method is ONLINE or OFFLINE. (This can be selected in NMS PC Setup Monitoring settings view).

Menu Command	*Description*
Start	Start monitoring. Will send NMS messages defined in the SATEL NMS PC Setup *Monitoring settings view,* Polling List, to gather diagnostic information from the radio modem network. As polling proceeds the views of NMS PC Monitoring
Stop	Stop monitoring. If monitoring is Started again, the previous monitoring data will remain and be shown as normal. (Unless the whole program is closed and restarted)

6.5 Monitoring views

The views are accessed using the *Tabbed control* located at the top of the *View area*. The name of the view is displayed on the tab. Click on the tabs to change the view.

6.5.1 Link Map

This view shows the network as a map, almost exactly like the NMS PC Setup does. Information about modem diagnostics can be shown on the modem icon labels (by checking the option) and link RSSI values are shown on the links.

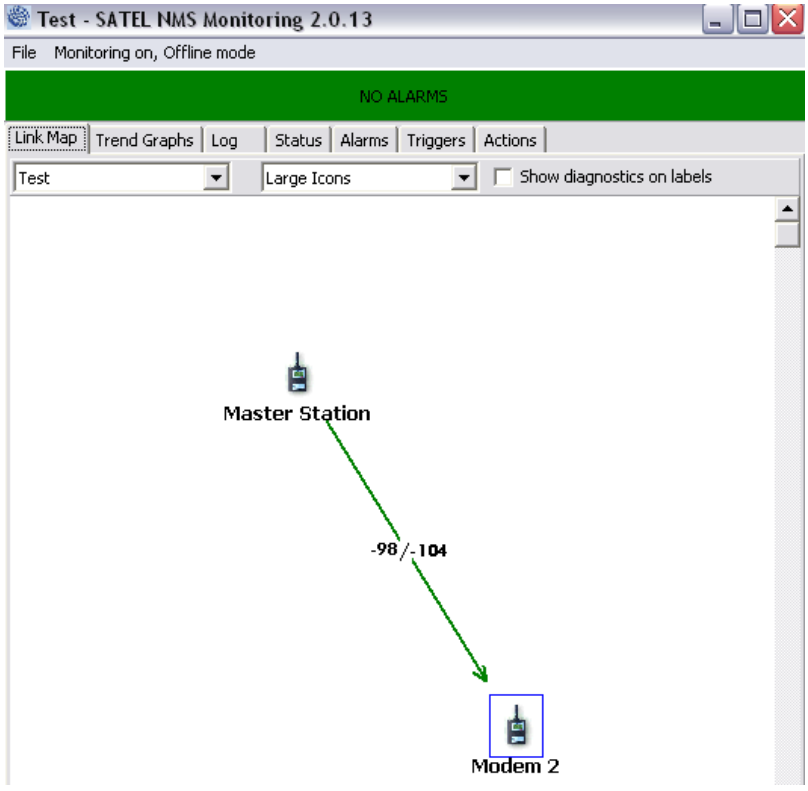


Figure 32: Link map view

Options in this view:

Option	*Explanation*
Select which Network is display on the view, by choosing the **network's name** from the **ComboBox.**	A system contains one or more Networks. Each network has their own topology (modems and links) Only one can be displayed at a time. Choose which one you wish to be displayed.
Choose small or large modem icons by selecting from a **ComboBox.**	Select either small or large modem icons. The link thickness line will also change.
Display modem diagnostics on modem icon labels by checking the **Show diagnostics on labels CheckBox.**	Show diagnostics other than Link RSSI on the modem icon labels
Move the icons around.	The icon positions can be changed but the new position will not be saved and will return to normal when the program is restarted. The positions must be changed in NMS PC Setup to be permanent.

6.5.2 Trend Graphs

This view shows diagnostics in graph form. Each received value from the system becomes a data point in one of the graphs. Data from all networks in the system is displayed.

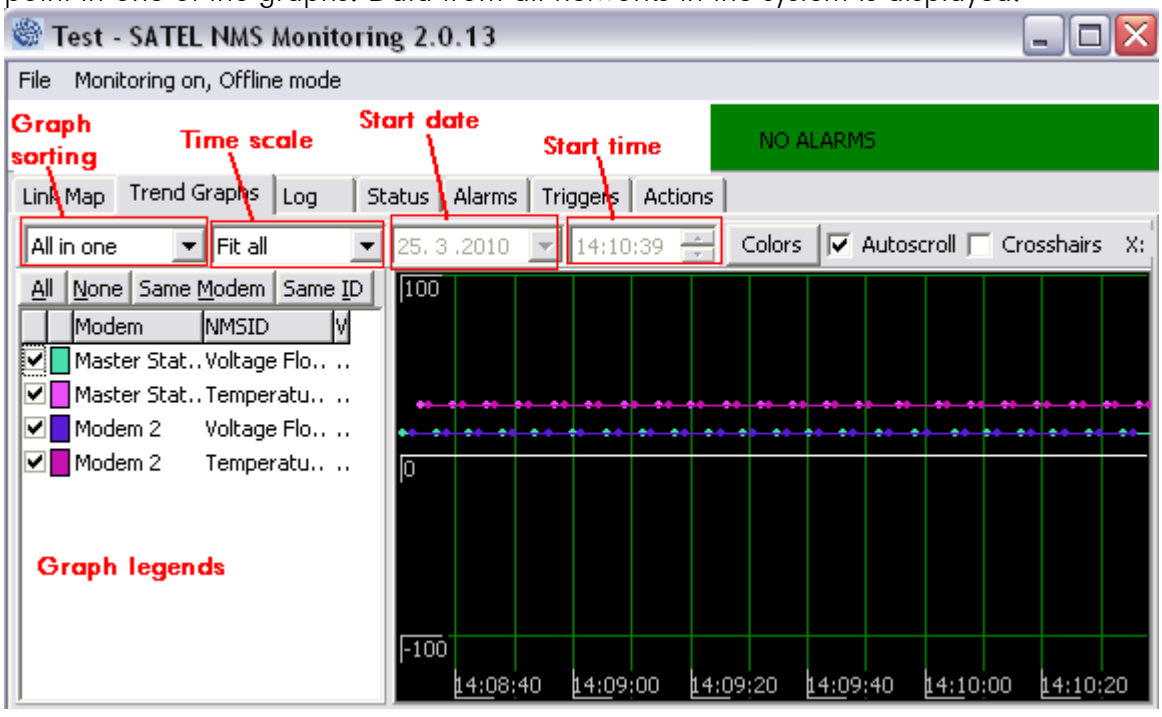
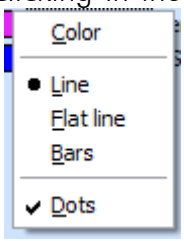


Figure 33: Trend Graphs view

Options in this view:

Option	*Explanation*
Graph sorting	<feature not supported yet>
Time scale	Choose the time span to be shown. The selection equals the length of the X-axis on the graph.
Start date	Select first visible date on the X-axis of the graph. Note that if Autoscroll is selected, this and Start time are disabled (greyed) and the first visible data point depends on the Time scale and current date time.
Start time	Select first visible time on the X-axis of the graph. See comments above.
Colours button	Choose colours of the graph background, grids and numeric labels.
Autoscroll	The view will scroll automatically forward and display the newest data points as they arrive.
Crosshairs	Two lines are drawn intersecting at the mouse cursor to help comparing graph values.
Graph Legend	One row is displayed for each *Poll Item* that have been defined in Monitoring settings (NMS PC Setup). The Checks ☑ control visibility of the graphs. You can easily check either **All**, **None**, **Same Modem** or **Same ID** graphs by clicking the small buttons at he top of the Legend.
Choose the colour of a graph	The color of a graph can be changed by **right-clicking** on a color box ■ and selecting "Color" from the pop-up menu. The color choices are not saved and are randomized each time a system file is loaded.
Choose line style of a graph	By right clicking in the Graph Legend view, the context menu  appears. You can choose one of three line style: • Line: data points are connected by straight lines • Flat line: changes in data are shown as steps • Bars: Each data point is drawn as bar from the origin (Y=0) You can also choose if Dots are drawn at the position of each data point (default on)

6.5.3 Log

Shows NMS messages sent and received to and from the system radio modems.

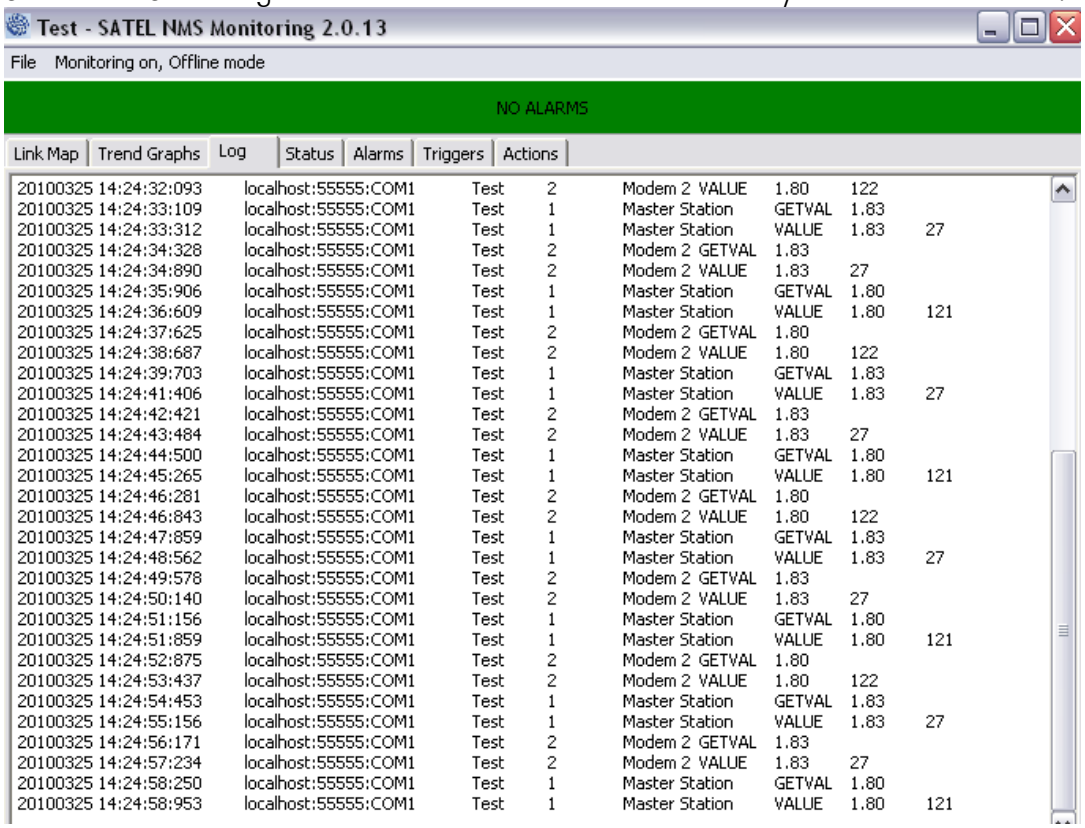

Test - SATEL NMS Monitoring 2.0.13
File Monitoring on, Offline mode
NO ALARMS
Link Map | Trend Graphs | Log | Status | Alarms | Triggers | Actions
20100325 14:24:32:093 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.80 122
20100325 14:24:33:109 localhost:55555:COM1 Test 1 Master Station GETVAL 1.83
20100325 14:24:33:312 localhost:55555:COM1 Test 1 Master Station VALUE 1.83 27
20100325 14:24:34:328 localhost:55555:COM1 Test 2 Modem 2 GETVAL 1.83
20100325 14:24:34:890 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.83 27
20100325 14:24:35:906 localhost:55555:COM1 Test 1 Master Station GETVAL 1.80
20100325 14:24:36:609 localhost:55555:COM1 Test 1 Master Station VALUE 1.80 121
20100325 14:24:37:625 localhost:55555:COM1 Test 2 Modem 2 GETVAL 1.80
20100325 14:24:38:687 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.80 122
20100325 14:24:39:703 localhost:55555:COM1 Test 1 Master Station GETVAL 1.83
20100325 14:24:41:406 localhost:55555:COM1 Test 1 Master Station VALUE 1.83 27
20100325 14:24:42:421 localhost:55555:COM1 Test 2 Modem 2 GETVAL 1.83
20100325 14:24:43:484 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.83 27
20100325 14:24:44:500 localhost:55555:COM1 Test 1 Master Station GETVAL 1.80
20100325 14:24:45:265 localhost:55555:COM1 Test 1 Master Station VALUE 1.80 121
20100325 14:24:46:281 localhost:55555:COM1 Test 2 Modem 2 GETVAL 1.80
20100325 14:24:46:843 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.80 122
20100325 14:24:47:859 localhost:55555:COM1 Test 1 Master Station GETVAL 1.83
20100325 14:24:48:562 localhost:55555:COM1 Test 1 Master Station VALUE 1.83 27
20100325 14:24:49:578 localhost:55555:COM1 Test 2 Modem 2 GETVAL 1.83
20100325 14:24:50:140 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.83 27
20100325 14:24:51:156 localhost:55555:COM1 Test 1 Master Station GETVAL 1.80
20100325 14:24:51:859 localhost:55555:COM1 Test 1 Master Station VALUE 1.80 121
20100325 14:24:52:875 localhost:55555:COM1 Test 2 Modem 2 GETVAL 1.80
20100325 14:24:53:437 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.80 122
20100325 14:24:54:453 localhost:55555:COM1 Test 1 Master Station GETVAL 1.83
20100325 14:24:55:156 localhost:55555:COM1 Test 1 Master Station VALUE 1.83 27
20100325 14:24:56:171 localhost:55555:COM1 Test 2 Modem 2 GETVAL 1.83
20100325 14:24:57:234 localhost:55555:COM1 Test 2 Modem 2 VALUE 1.83 27
20100325 14:24:58:250 localhost:55555:COM1 Test 1 Master Station GETVAL 1.80
20100325 14:24:58:953 localhost:55555:COM1 Test 1 Master Station VALUE 1.80 121

Figure 34: Log view

This log is the Main (traffic) log of the application. It is also written into a file. See chapter 7 Path to the log files is shown at the bottom of the window.

6.5.4 Status

Show latest status of all NMS diagnostic values being polled from the modems. Each row shows the status of one unique variable.

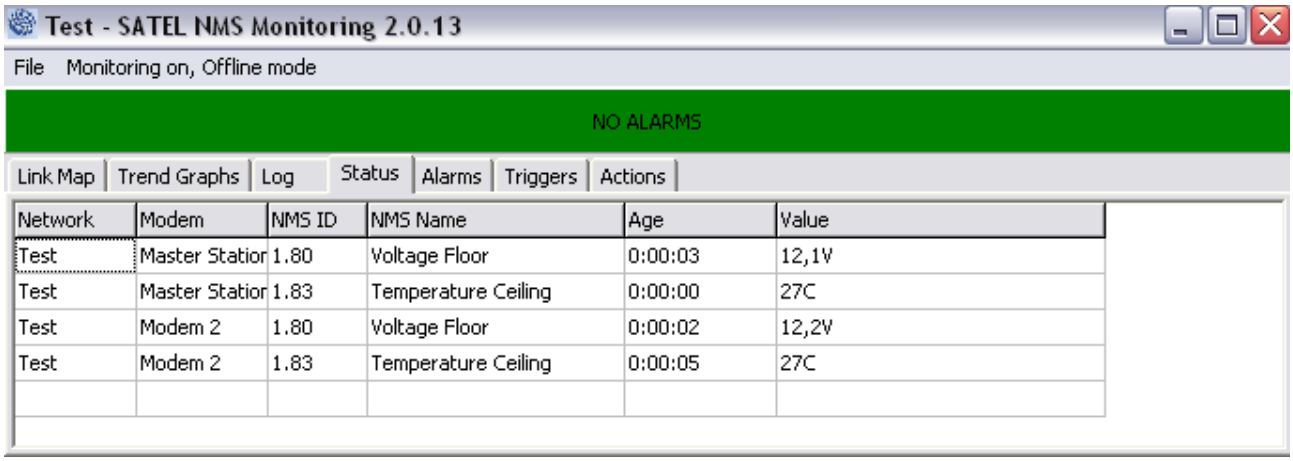

Test - SATEL NMS Monitoring 2.0.13
File Monitoring on, Offline mode
NO ALARMS
Link Map | Trend Graphs | Log | Status | Alarms | Triggers | Actions
Network Modem NMS ID NMS Name Age Value
Test Master Station 1.80 Voltage Floor 0:00:03 12,1V
Test Master Station 1.83 Temperature Ceiling 0:00:00 27C
Test Modem 2 1.80 Voltage Floor 0:00:02 12,2V
Test Modem 2 1.83 Temperature Ceiling 0:00:05 27C

Figure 35: Monitoring Status View

Column	*Explanation*
Network	Name of the network this diagnostic value and modem belong to.
Modem	Name of the modem.
NMS ID	NMSID of the diagnostic value.
NMS Name	Name of the diagnostic value.
Age	How "fresh" the value is, i.e. how much time has passed since the value was last received.
Value	The actual value.

6.5.5 Alarms

This is a list of new and old alarms. When alarms happen, they will be listed in the new alarms area. When "move to old alarms" is clicked, the alarms are moved to old alarms and the alarm indicator will turn green. This way you can "acknowledge" the alarms and still retain a list of alarms that have occurred earlier.

6.5.6 Triggers

This is a list of triggers that have matched.

6.5.7 Actions

This is a list of actions that have been performed by SATEL NMS PC Monitoring.

6.6 Troubleshooting

During monitoring the following problems might appear.

View	*Symptom*	*Possible cause*	*Solution*
Log	One remote modem **always** responds with an ERROR "No Response Received"	The modem address is incorrect in monitoring settings	Open the .sax file in NMS PC Setup and try to ping the modem. If the modem responds, the problem is in monitoring settings. Go to the Monitoring settings view and click "Update", then save system and restart monitoring.
		Modem settings are incorrect	Try to ping modem as above. If no response is received, the modem's settings are incorrect. Click Calculate routes and then synchronize the modem. Try to ping the modem to see it works before starting monitoring.
		No power or antenna	Check the cables and power supply.

Log	One or more remote modems **sometimes** respond ERROR "No Response Received"	Radio interference	There might be radio interference on the frequency. Try another frequency if legally possible. Try increasing TX power and/or enabling FEC.
		Message collisions	If your own system is running and you are sending NMS messages (monitoring is on) in the OFFLINE mode, message *will* collide sometimes. How often, depends on the polling interval of your system and the monitoring. Switch monitoring to use ONLINE mode to remove collisions, OR make polling interval(s) longer to lessen the amount of collisions.
Log	All modems in a network *except the master modem* **always** respond ERROR "No Response Received"	ONLINE mode with no user data traffic	ONLINE mode depends on user data to reach the modems. Since the master is directly connected using a cable, it responds. Either start the user data traffic or go to NMS PC Setup, Monitoring settings and switch to OFFLINE mode.
Log	All modems in a network **always** respond ERROR "No Response Received"	No connection to master modem	Check cables and/or connection settings. Use the "Local modem status" test in NMS PC Setup to make sure your cable / master connection is working. Then go to Monitoring settings, click Update and save the system. Then restart monitoring.
		Serial server is not configured correctly	Serial server's IP port setting (default 55555) must be the same that appears in the Log (example: localhost:55555:COM1) If bitrates and serial port settings other than 9600,8N1 are used, they must be configured in the serial server's *Communication settings* page. (This feature is broken in V2.0.12)

If the above suggestions do not help, please do not hesitate to contact SATEL Technical Support.

7 SATEL SERIAL SERVER

7.1 Overview

SATEL Serial Server is a separate program executable. It is meant to perform the following tasks:

- Act as a multiplexer and translator between SATEL NMS PC client programs and the serial ports of the PC.
- Allow installing and using the client programs from a different PC than the serial ports are located in.
- Allow the possibility to configure default serial port settings for direct TCP/IP access

SATEL NMS PC Setup and Monitoring act as clients to Serial Server's server. The clients access the server using TCP/IP sockets. For this reason Serial Server is configured to listen at a TCP/IP port, usually 55555, though this can be changed.
The TCP/IP traffic uses RAW sockets, and the protocol used is called S3CP (SATEL Serial Server Command Protocol). Usually this protocol is completely invisible to the user and there is no need to be concerned over it.

S3CP includes commands to handle serial ports and send and receive NMS messages. Serial server translates the TCP/IP requests to SATEL NMS Protocol messages which are passed to the serial ports and this way to the NMS (diagnostic) port of the Radio Modem. The responses from the modem are translated back to S3CP and sent to the client.

An alternative way to form a connection from NMS client programs to the NMS Port of a modem is to define a direct TCP/IP port mapping. In this way, Serial Server can be configured to listen at another TCP/IP port number, for example 55556, which is then directly mapped to a serial port, for example COM1. This kind of mapping also includes serial port settings, such as baud rate, parity etc. See 7.3.3 for more information. If this kind of connection is used, the client SW must be configured to use a Direct TCP/IP connection, see 5.8.1.1

7.2 Common tasks

7.2.1 Accessing the Serial Server User Interface

Serial server is started by other SATEL NMS PC Programs as they need it. By default Serial Server does not open a window. If you need to use the user interface (views) of Serial Server, the window can be accessed from Windows Task Bar. When the Task bar item is clicked, the window opens.

Note that usually serial server does not need to be configured or accessed in any way. The NMS Client programs automatically start Serial Server in the same PC and communicate with it. Only if you wish to define default serial port settings and/or change the serial server preferences do you need to open serial server.

7.2.2 Using serial ports of another computer

If the serial ports and the NMS programs are located in different PC's, the Serial Server must be installed into the PC having the ports, and the programs in the other PC can communicate with it over TCP/IP and use the serial ports. In this case the serial server must be started manually or from the Startup folder of Windows, for example.
See 7.3.3 for more information.

7.2.3 Troubleshooting serial port problems

Some problems with serial port hardware can cause the serial ports to get stuck, unable to be opened or become unresponsive. Some serial port hardware or drivers cannot tolerate the port being opened or closed quickly. For this reason Serial Server by default keeps the ports open for 15 seconds, rather than open and close them in quick succession. See 7.3.4 for hardware compatibility settings if you are having problems.

7.2.4 Command line use

Serial server can be used directly by opening a terminal connection to its command port (default 55555).
We recommend using putty.exe. Configure the connection as a RAW connection (no telnet control codes or SSH!) By writing "help" and pressing enter you can get a list of commands and instructions.

7.3 Server views

7.3.1 Server Log

This view shows information about the server. It shows incoming TCP/IP commands from NMS Client SW (NMS PC Setup and Monitoring), NMS Messages sent to and received from the Serial ports, and miscellaneous server messages.

SATEL Serial Server 2.0.13
Server Log
Serial port list
Communication Settings
Additional Settings
25.3.2010 14:27:21 Connection from 127.0.0.1:4976 closed: Connection Closed Gracefully.
25.3.2010 14:27:21 The command connection 127.0.0.1:4976 stopped using Port COM1,9600,8N1
25.3.2010 14:27:23 Got Connection on port 127.0.0.1:55555 from 127.0.0.1:4977
25.3.2010 14:27:23 Opening COM port COM1,9600,8N1,0
25.3.2010 14:27:23 Send NMS: GETVAL SAddr:0001H DAddr:0002H ReqID:C5ECH D-TTL:0 FType:IMMEDIATE ID: 1.80 Name: Voltage Floor
25.3.2010 14:27:23 Got NMS: ACK/OK SAddr:0001H DAddr:0001H ReqID:C5EDH D-TTL:1 FType:IMMEDIATE
25.3.2010 14:27:23 Got NMS: ACK/SENT SAddr:0000H DAddr:0000H ReqID:C5EDH D-TTL:0 FType:IMMEDIATE
25.3.2010 14:27:23 Got NMS: VALUE SAddr:0002H DAddr:0001H ReqID:C5EDH D-TTL:18 FType:IMMEDIATE Parameter ID: 1.80 Name: Voltage Floor Value: 122
25.3.2010 14:27:23 Connection from 127.0.0.1:4977 closed: Connection Closed Gracefully.
25.3.2010 14:27:23 The command connection 127.0.0.1:4977 stopped using Port COM1,9600,8N1
25.3.2010 14:27:25 Got Connection on port 127.0.0.1:55555 from 127.0.0.1:4978
25.3.2010 14:27:25 Opening COM port COM1,9600,8N1,0
25.3.2010 14:27:25 Send NMS: GETVAL SAddr:0001H DAddr:0001H ReqID:8868H D-TTL:0 FType:IMMEDIATE ID: 1.83 Name: Temperature Ceiling
25.3.2010 14:27:25 Got NMS: ACK/OK SAddr:0001H DAddr:0001H ReqID:8869H D-TTL:1 FType:IMMEDIATE
25.3.2010 14:27:25 Got NMS: VALUE SAddr:0001H DAddr:0001H ReqID:8869H D-TTL:1 FType:IMMEDIATE Parameter ID: 1.83 Name: Temperature Ceiling Value: 27
25.3.2010 14:27:25 Connection from 127.0.0.1:4978 closed: Connection Closed Gracefully.
25.3.2010 14:27:25 The command connection 127.0.0.1:4978 stopped using Port COM1,9600,8N1
25.3.2010 14:27:26 Got Connection on port 127.0.0.1:55555 from 127.0.0.1:4979
25.3.2010 14:27:26 Opening COM port COM1,9600,8N1,0
25.3.2010 14:27:26 Send NMS: GETVAL SAddr:0001H DAddr:0002H ReqID:6368H D-TTL:0 FType:IMMEDIATE ID: 1.83 Name: Temperature Ceiling
25.3.2010 14:27:26 Got NMS: ACK/OK SAddr:0001H DAddr:0001H ReqID:6369H D-TTL:1 FType:IMMEDIATE
25.3.2010 14:27:26 Got NMS: ACK/SENT SAddr:0000H DAddr:0000H ReqID:6369H D-TTL:0 FType:IMMEDIATE

Figure 36: Server Log view

7.3.2 Serial port list

This view shows the current status of all known serial ports in the PC.

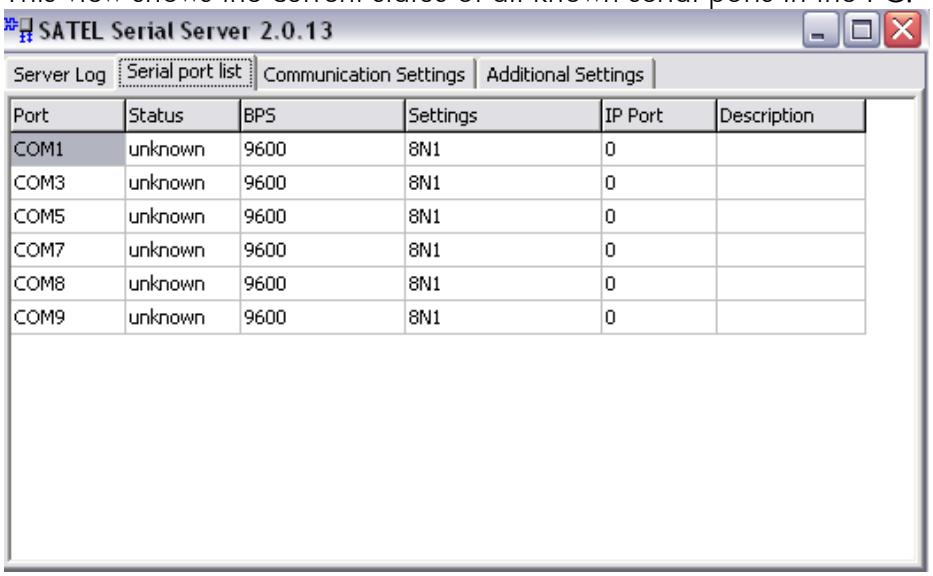


Figure 37: Serial port list view

You can use Right-Click to access a *context-sensitive menu* which includes only a single item: **Update.** Clicking Update updates the view to show the current status of the serial ports.

Column	*Explanation*
Port	Serial port name/number
Status	**Open**: Serial server has opened the port and is using it **Open_x0**: Serial server is not using the port, but is keeping it open because the KeepOpen feature is in use (See 7.3.3) **Open_x2** (or more): Several NMS PC client programs are sharing the port **InUse:** The port is in use by a program (or serial server itself if update has not been clicked) **Available**: Port is not in use by any program **unknown:** Automatic port status detection (See7.3.3) is off and Update has not been clicked, the port's status is unknown.
BPS	If status begins with Open, shows the port speed which Serial Server is using for that port. If Status is anything else, shows the default port speed that will be used if the port is opened without the opening software specifying a speed. This can happen for example if a direct TCP/IP connection is opened (See 7.3.3)
Settings	Anything said about the BPS column and status also applies to this column. Shows the other settings of the serial port. The first number is the number of data bits: 7 or 8 The second character is the parity settings: N(o parity), E(ven parity), O(dd parity), M(ark) or S(pace). The third character is the number of stop bits:0, 1 or 2
IP Port	Usually 0. This means no direct IP port has been mapped to this serial port. Other numbers indicate that a direct IP port HAS been mapped (See 7.3.3)
Description	If a description has been given for the port, it is shown here (See 7.3.3)

7.3.3 Communication Settings

This view allows you to configure the TCP/IP ports the Serial Server is listening at, and define default serial port settings.

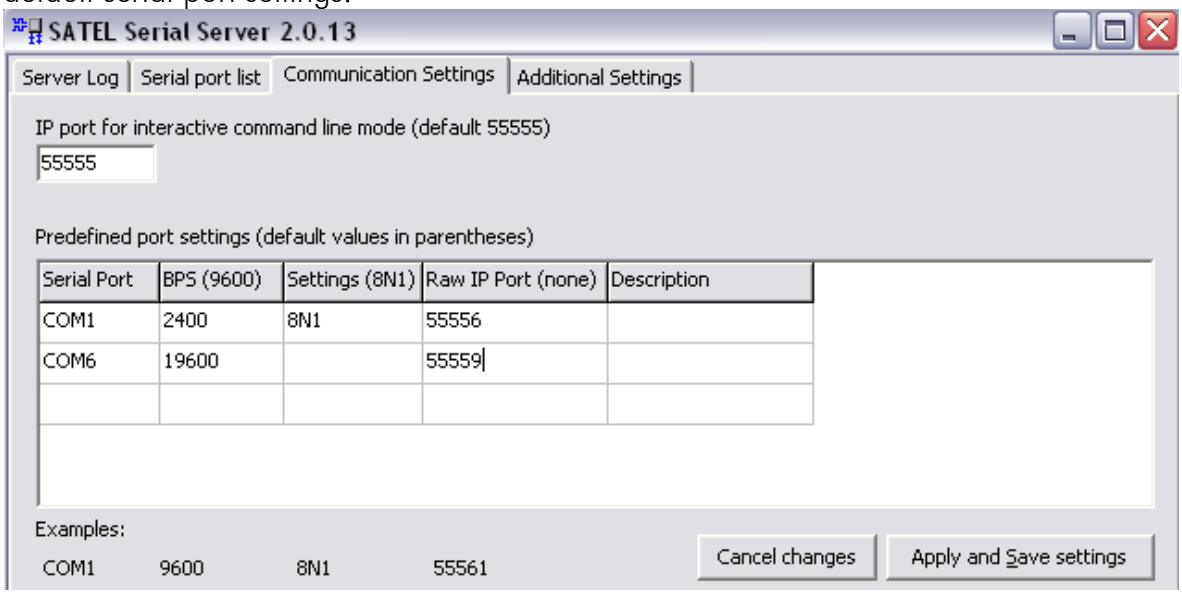


Figure 38: Communication Settings view

View control	*Explanation*
IP Port for interactive command line mode	This is the main IP port where serial server is expecting connections from SATEL NMS client programs. This port uses the S3CP protocol.
Predefined port settings	Default port settings and Direct IP port to serial port mappings can be defined here. Just click and edit the table directly.
Serial Port	Enter the desired serial port name like shown, "COM1" is the serial port 1 etc. This String is the Windows Device Name of the serial port.
BPS	Define a serial port speed. Use only valid speeds that the modem supports and is configured with. Examples: 2400, 19200 IMPORTANT NOTE: This setting does not work in Version 2.0.12 of SATEL NMS PC *Monitoring*. It always uses 9600 bps. This will be fixed for later versions.
Settings	Define port settings. Use only valid settings that the modem supports and is configured with. The first number is the number of data bits: 7 or 8 The second character is the parity settings: N(o parity), E(ven parity), O(dd parity), M(ark) or S(pace). The third character is the number of stop bits:0, 1 or 2

	IMPORTANT NOTE: This setting does not work in Version 2.0.12 of SATEL NMS PC *Monitoring*. It always uses 8N1. This will be fixed for later versions.
Description	Write a freely chosen description for the port if you wish. This description is shown in NMS client programs (Setup), in the Network connection settings window, Available COM ports list.
Cancel changes	Lose all your changes in this view and load the last saved settings
Apply and Save settings	Save and start using the settings you have entered. Settings are saved into the Windows registry. (HKEY_CURRENT_USER\Software\Satel\SATELSerialServer\1.0) Please do not modify them manually, there are no hidden settings!

7.3.4 Additional Settings

This view controls the settings of Serial Server

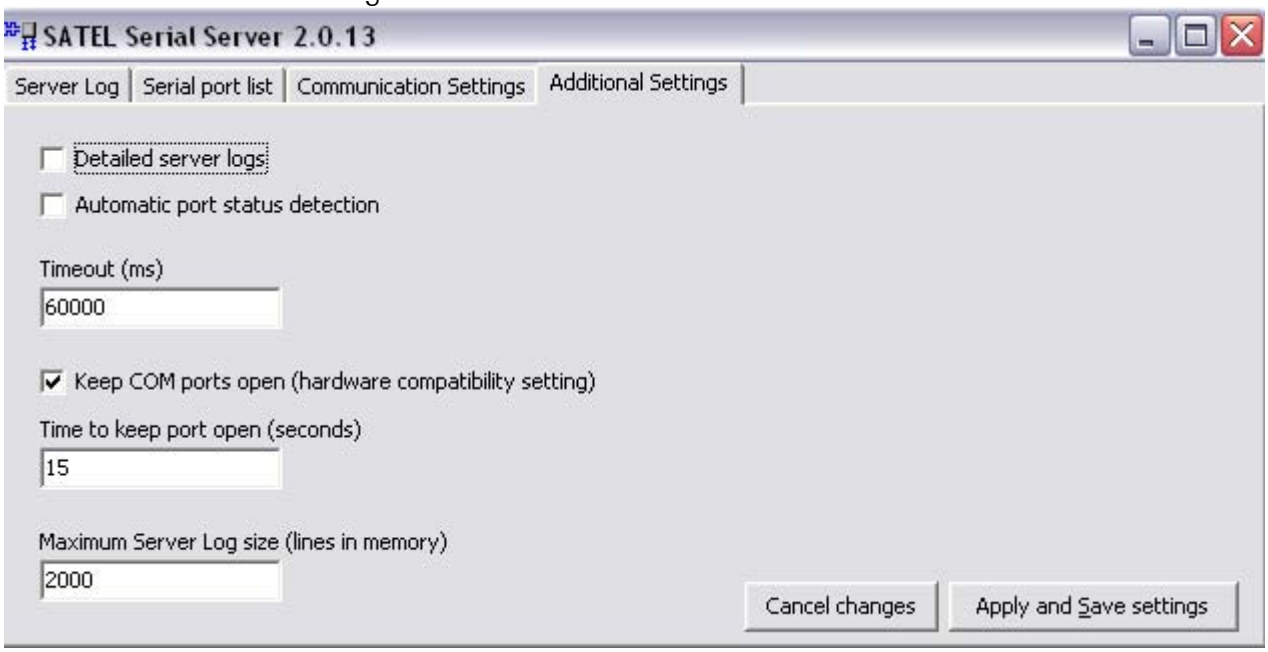


Figure 39: Additional Settings view

View control	*Explanation*
Detailed server logs	Shows more text in Server Log view. Additional log items are mostly hexadecimal dumps of the NMS protocol.
Automatic port status detection	Automatically tries to open serial ports to see if they are available. Some serial ports and/or drivers crash when this option is on. If you are having problems, disable it.
Timeout (ms)	Timeout of NMS Messages in milliseconds. Leave this as a very large number (default 60000, or 60 seconds), as the client

	programs handle timeouts. **Setting this to a lower number can cause "No Response" problems in Monitoring!** If you are using a very large network with ONLINE mode and the user data polling sequence is longer than 60 seconds, increase this value to at least as high!
Keep COM ports open (hardware compatibility setting)	Keeps serial ports open for some time, instead of closing and opening them in between of all NMS messages. Some serial port hardware require this to be enabled, others require it to be disabled. Most work either way. Default is Enabled.
Time to keep port open	This value is in seconds. Default is 15. IT is usually not needed to edit this value.
Maximum server log size	How many lines of Server Log to keep in RAM. If set too large, updating the Server Log View takes significant CPU resources. It is recommended to keep this below 5000.
Cancel changes	Lose all your changes in this view and load the last saved settings
Apply and Save settings	Save and start using the settings you have entered. Settings are saved into the Windows registry. (HKEY_CURRENT_USER\Software\Satel\SATELSerialServer\1.0) Please do not modify them manually, there are no hidden settings!

8 LOG FILES

SATEL NMS PC programs will write some log files. Some of the programs also contain logs which are not written to disk, but can be viewed in the program window and copied to the clipboard. The user can also cause SATEL NMS PC Monitoring to write custom log files during monitoring by defining certain triggers and actions. (see 5.10.1 Adding an Action)

Whenever a program adds a new log line to the log file on disk, the program will do so according to the following procedure:

- open the file
- write into it
- close it

This makes it possible to import data into other programs in almost real time from the log file, because the log file is not reserved for exclusive use by the program. Any reading program must also take care to open the file for shared read-only access so as not to prevent the writing.

8.1 Log types

SATEL NMS PC Monitoring will write a log file to the location defined in monitoring settings of SATEL NMS PC Setup. The log file is a Tab-separated file. There is one log entry per line.

One log file per day will be generated. The log files are named in the following format: satelnms*yyyymmdd*.log where *yyyy* is the year, *mm* is the month and *dd* is the current day. Example: satelnms20081229.log.

File name	Location	Format	Description	Application
satelnms*yyyymmdd*.log	Default: Program Install directory OR Monitoring Log file directory, if set.	Tab-separated	Monitoring traffic log	SATEL NMS PC Monitoring
triggers*yyyymmdd*.log		Lines of text	Monitoring trigger log	SATEL NMS PC Monitoring
actions*yyyymmdd*.log		Lines of text	Monitoring action log	SATEL NMS PC Monitoring
alarms*yyyymmdd*.log		Tab-separated	Monitoring alarm log	SATEL NMS PC Monitoring
Custom	Any directory	Custom	Custom user log	SATEL NMS PC Monitoring
None	In Serial Server	Lines of text	Serial server log	SATEL Serial Server
None	In NMS PC Setup	Lines of text	Comm Log	SATEL NMS PC Setup

8.1.1 Monitoring traffic log

SATEL NMS PC Monitoring writes all sent and received NMS messages into this log file. The log file is created when the first line of the day is written, i.e. there will never be an empty log file.

Log file columns, separated by **tab** characters:

- Timestamp (example: 6.6.2007 14:10:53)
- Connection (example: localhost:55555:COM5)
- Network Name (example: Test Net)
- Destination address (example: 3)
- Destination modem name (example: Modem 3)
- Command (example: GETVAL)
- NMSID (example: 1.83)
- Value (or empty if command is GETVAL) (example: -95 dBm, From 1)

Example lines from a log file: (Note that tab characters have been replaced by dual spaces here for readability)

```
6.6.2007 14:17:26  localhost:55555:COM5  Test Net  3  Modem 3 SETVAL  1.3086  1
6.6.2007 14:17:26  localhost:55555:COM5  Test Net  3  Modem 3 VALUE  1.55  -95 dBm, From 1
6.6.2007 14:17:28  localhost:55555:COM5  Test Net  1  Master Station GETVAL  1.80
6.6.2007 14:17:28  localhost:55555:COM5  Test Net  1  Master Station VALUE  1.80  120
6.6.2007 14:17:31  localhost:55555:COM5  Test Net  2  Modem 2 GETVAL  1.80
6.6.2007 14:17:31  localhost:55555:COM5  Test Net  2  Modem 2 VALUE  1.80  121
6.6.2007 14:17:33  localhost:55555:COM5  Test Net  3  Modem 3 GETVAL  1.80
6.6.2007 14:17:33  localhost:55555:COM5  Test Net  3  Modem 3 VALUE  1.80  122
6.6.2007 14:17:34  localhost:55555:COM5  Test Net  1  Master Station GETVAL  1.83
6.6.2007 14:17:34  localhost:55555:COM5  Test Net  1  Master Station VALUE  1.83  29
```

8.1.2 Monitoring trigger log

SATEL NMS PC Monitoring writes a line into this log whenever a trigger matches. The log file is created when the first line of the day is written, i.e. there will never be an empty log file.
The log file contains one event per line. The line contains Timestamp (example: 6.6.2007 14:10:53), followed by Trigger name and Description. The values are NOT tab-separated.
Examples:

```
29.10.2008 15:48:13 Trigger: Modem 2, Voltage Floor(1.80) is less than 12. Causes Alarm
29.10.2008 15:48:55 link breaks: Modem 2, (15.4095) link breaks . Causes Alarm
```

8.1.3 Monitoring alarm log

SATEL NMS PC Monitoring writes a line into this log whenever an alarm is caused by a trigger. The log file is created when the first line of the day is written, i.e. there will never be an empty log file.
The log file contains one event per line. The line contains the following columns:

- Timestamp (example: 6.6.2007 14:10:53)
- Network Name (example: Test Net)
- Modem address (example: 3)
- Modem name (example: Modem 3)
- NMSID (example: 1.83)
- NMSID Name (example: Voltage)

- Value (example: -95 dBm, From 1)
- Alarm condition
- Trigger threshold

Example log line (tabs replaced by double spaces for clarity):

```
29.10.2008 15:47:49  test  1  Master Station  1.80  Voltage Floor  102  is less than  12
```

8.1.4 Monitoring action log

SATEL NMS PC Monitoring writes a line into this log whenever an action is performed in response to a matching trigger. The log file is created when the first line of the day is written, i.e. there will never be an empty log file.
The log file contains one event per line. The line contains Timestamp (example: 6.6.2007 14:10:53), followed by Action name and last result. The values are NOT tab-separated.

8.1.5 Custom User log

Custom user logs are written by SATEL NMS PC Monitoring. The user must define trigger and actions settings that cause Monitoring to write the log. Many variables are available to be written into the log.
See Chapters *5.10.1* Adding an Action and *9.1 Custom Log File: Example Trigger and Action definitions* for more information.

8.1.6 Serial server log

SATEL Serial Server includes a log view with details about several communication events between it and the other programs as well as the modems.
Lines from this log can be selected using the mouse and copied using the keyboard shortcut Ctrl-C. This can be useful if troubleshooting NMS communication issues with SATEL Technical support.
Information included in this log:

- Serial port opening and closing
- NMS message requests and responses
- NMS Errors

8.1.7 Comm Log

SATEL NMS PC Setup has a log view for communication events and messages. Lines from this log can be selected with the mouse and copied using the keyboard shortcut Ctrl-C. This can be useful if troubleshooting NMS communication issues with SATEL Technical support.

9 EXAMPLES

This chapter contains some examples of configuring the settings.

9.1 Custom Log File: Example Trigger and Action definitions

Programs used: SATEL NMS PC Setup

This example shows how to configure Monitoring settings of a system so that the following functionality is achieved:
Diagnosed parameters are

- Voltage of each modem
- Temperature of each modem
- RSSI of each link in both directions

An entry will be written in a *Custom Log file* when (and ONLY when):

- The Voltage of a modem drops below 12 Volts
- The Temperature of a modem rises above 40 degrees Celsius
- The RSSI of a Link drops below -105 dBm
- An NMS message timeouts

The filename of the custom log will be "C:\work\NMS_SCADA_alarms.log"

9.1.1 Polling settings

These settings are defined in the Polling settings tab (5.9.1).
All Diagnostic parameters are checked. Other settings are left as they are.

9.1.2 Actions

One Action, "Write to Log" will be defined. This is done first, so that the Action may be added straight away to the Trigger definitions.

Use the Action settings tab (5.10). Click Add and use the following values:

Action name	Write to Log
File name	c:\work\NMS_SCADA_alarms.log
Line to insert	$TriggerName$$t$$ModemName$$t$$NmsName$$t$$NmsValue$$t$$LogTime$$t$$LogDate$

The line that will be written to the log consists of the following variables, separated by ASCII tab characters: TriggerName, ModemName, NmsName, NmsValue, LogTime, LogDate. A linefeed (Windows-style) is automatically added after every line written into the log.

The line could also have included any text, additional linefeeds and/or multiples of the same variable.

9.1.3 Trigger settings

Four triggers will be defined. This is done in the Trigger settings tab (5.9.2). Click "Add" and select the correct values according to the following table. Then Click OK and repeat for the next Trigger.

Name	Type	Threshold	NMSID	Applies to	Cause Alarm	Actions
Voltage Low	less than	12	Voltage Floor	All modems in system	Yes	Write to Log
RSSI Low	less than	-105	RSSI			
Temperature High	greater than	40	Temperature Ceiling			
No response	NMS msg timeouts	0	-			

9.1.4 Example log file

To create this example, the settings defined in chapter 6 were loaded into SATEL NMS PC Monitoring and the network was allowed to run for a few minutes. At first, modem 2 was without power, which caused the No response entries in the log. The Voltage was kept below 12 Volts for both modems, which caused the Voltage Low entries. The radio connection was poor (No antennas & low TX power), which caused the "RSSI Low" entries in the log.

```
Voltage Low     Master Station Voltage Floor  109     13:53:43:0197  20071030
No response     Modem 2 Voltage Floor  No response    13:53:55:0041  20071030
No response     Modem 2 Temperature Ceiling    No response    13:54:09:0432  20071030
RSSI Low                Master Station RSSI    -109 dBm, From 2       13:54:19:0088  20071030
No response     Modem 2 RSSI    No Response    13:54:23:0822  20071030
Voltage Low     Master Station Voltage Floor  110     13:54:29:0463  20071030
No response     Modem 2 Voltage Floor  No response    13:54:34:0197  20071030
No response     Modem 2 Temperature Ceiling    No response    13:54:48:0572  20071030
RSSI Low                Master Station RSSI    -109 dBm, From 2       13:54:58:0213  20071030
No response     Modem 2 RSSI    No Response    13:55:02:0948  20071030
Voltage Low     Master Station Voltage Floor  109     13:55:08:0604  20071030
No response     Modem 2 Voltage Floor  No response    13:55:13:0338  20071030
No response     Modem 2 Temperature Ceiling    No response    13:55:27:0713  20071030
RSSI Low                Master Station RSSI    -109 dBm, From 2       13:55:37:0370  20071030
Voltage Low     Master Station Voltage Floor  110     13:55:42:0698  20071030
Voltage Low     Modem 2 Voltage Floor  107     13:55:47:0448  20071030
RSSI Low                Master Station RSSI    -109 dBm, From 2       13:55:53:0354  20071030
```

9.1.5 Notes

The tab character should be used as a delimiter in the custom log file, since the NMS values may contain other characters typically used as separators, such as commas (,) and semicolons (;). The $NumValue$ variable can contain numbers, the minus sign '-' and/or the decimal point '.'.

9.2 Send email example: Action Definitions

This chapter shows example action settings which can be used to send email messages.

NOTE: The email sending functionality is not included in SATEL NMS PC. An external email sending application must be used. In this example, a program called sendemail.exe is used. SATEL is not affiliated with the maker of this program in any way, and does not offer user support for the program beyond this document.

9.2.1 Preparation

Define the network and polling and trigger settings similarly to the previous chapter.

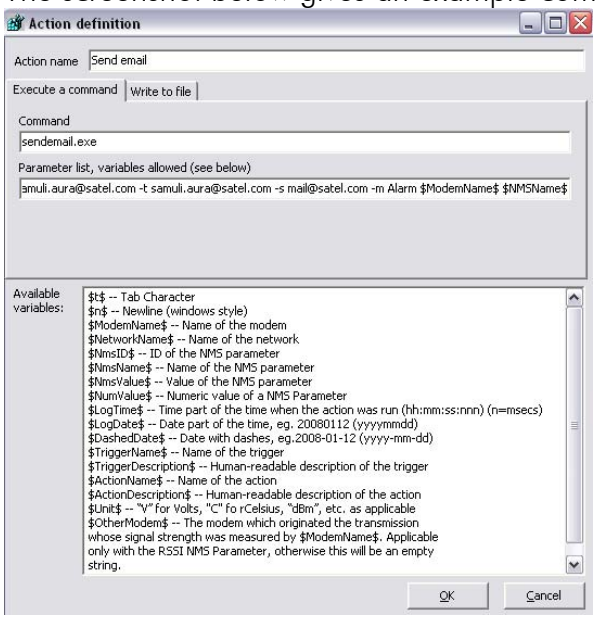
9.2.2 Action setting to send email

Install an email sending program, such as the sendemail program (http://caspian.dotconf.net/menu/Software/SendEmail/) or Blat (http://www.blat.net/)

Test the program using the windows shell (Start->Run->cmd.exe) first. When you know which command line options are needed to send email in your environment, you are ready to define the Action.

Go to Monitoring->Action settings tab (see 5.10). Click Add. Select the Execute a command Tab, and fill in the fields.

Command is the full name including path to the sendemail.exe
Parameter list is the command line including all the options necessary.
You may use the SATEL $variables$ to include information about the alarm in the email message.
The screenshot below gives an example command line.


Action definition
Action name
Send email
Execute a command
Write to file
Command
sendemail.exe
Parameter list, variables allowed (see below)
amuli.aura@satel.com -t samuli.aura@satel.com -s mail@satel.com -m Alarm $ModemName$ $NMSName$
Available variables:
t -- Tab Character
n -- Newline (windows style)
$ModemName$ -- Name of the modem
$NetworkName$ -- Name of the network
$NmsID$ -- ID of the NMS parameter
$NmsName$ -- Name of the NMS parameter
$NmsValue$ -- Value of the NMS parameter
$NumValue$ -- Numeric value of a NMS Parameter
$LogTime$ -- Time part of the time when the action was run (hh:mm:ss:nnn) (n=msecs)
$LogDate$ -- Date part of the time, eg. 20080112 (yyyymmdd)
$DashedDate$ -- Date with dashes, eg.2008-01-12 (yyyy-mm-dd)
$TriggerName$ -- Name of the trigger
$TriggerDescription$ -- Human-readable description of the trigger
$ActionName$ -- Name of the action
$ActionDescription$ -- Human-readable description of the action
$Unit$ -- "V" for Volts, "C" fo rCelsius, "dBm", etc. as applicable
$OtherModem$ -- The modem which originated the transmission whose signal strength was measured by $ModemName$. Applicable only with the RSSI NMS Parameter, otherwise this will be an empty string.
OK
Cancel